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FARM ENGINES AND THEIR CARE.

A. S. Kenyon, C.E., Engineer for Agriculture.

Legislation has recently been passed providing for the inspection of all boilers within cities, towns, or boroughs, and within such shires or portions of shires as may be ordered by the Governor in Council, and for the reporting of any boiler explosion or accident in any part of the State. The necessity for such legislation has arisen through a number of more or less serious accidents, due to negligence or ignorance. Steam engines are now in common use on dairy and other farms. Through ignorance, more than, as a rule, through carelessnesss, their boilers may be sources of danger to those working near them; may become worn out long before they should; and may consume much more fuel than necessary.

The following paper, by Mr. E. R. Meekison, late Senior Inspector of Mines for Victoria, will give many hints worth noting:—

BOILER.—The most dangerous part of steam machinery is the boiler, and the greatest care should be exercised in giving proper attention to it. After a boiler has been in fair work for about 20 years, more or less, according to the original quality of the iron or steel, and of the feed water used—the plates begin to change from a fibrous to a granular or cast-iron character, and when this change takes place a boiler cannot be worked with safety, as it is then in a dangerous condition and liable to accident at any moment. In some cases, however, boilers have been worked for periods of over 30 years, but in such cases there have been exceptionally favorable circumstances under which they have been used. A few years ago I examined a boiler over 20 years old, which had been offered for sale. The plates, angle irons, and rivets were not corroded to any great extent, but on trying the edge of the plates with a chisel the iron broke off short, just as cast-iron would have done. There was no fibre in the plates, and a cast-iron boiler would have been just as reliable as the one I refer to. Every boiler should be fitted with the most approved appliances to insure its safety, but the best appliances cannot be relied upon without an experienced and careful driver being in charge. In fixing boiler mountings a good plan is now in general use, and that is to fix them to cast-iron or steel seatings riveted on the boiler. The surface of the seatings which receives the mountings being flat in all cases, they can be faced, and consequently

a perfectly tight joint can be easily made. Doubtless many have at times experienced a great difficulty in making joints on flanges, which are supposed to be cast to the circle of the boiler, but which, in the majority of cases, do not fit correctly. These seatings are sometimes objected to on the score of expense, but the money would be better expended on seatings than in attaching domes, which, besides being often useless appendages, weaken the boiler by requiring so large a hole to be cut in the shell. The seating used for the man-hole door would also strengthen that part of the boiler round the man-hole door.

WATER GAUGES.—Glass water gauges should be fixed on every boiler, and the best plan is to have two on each. I consider wheel scavenger cocks to be the best—especially where bad water is used. I have known the common plug cocks require grinding every week, and they have only lasted a short time. When these cocks have been replaced with scavenger cocks, the latter have worked under exactly the same conditions as the former for years, and have not required to be ground. In many cases I have found the glass gauges fixed too low down on the front of the boiler, and some of them would show water in the glass when it was off the top of the tube. This is a most dangerous position in which to have gauges fixed. The bottom mountings of gauge glasses should never be fixed lower than 2 inches above the highest part of the tube; this would give about 4½ inches of water over the tube when the water was at the lowest visible point in the glass.

TRY COCKS.—The bottom try cocks should be fixed at the level of the bottom of the glass, and when there are 4 inches of water over the tube, the bottom try cocks should blow steam. By fixing the cocks at this height, if through any cause the water should disappear from the glass, there would be no danger as long as water came out of the bottom cock of the gauge mountings, but as soon as it is below the bottom cock the driver should draw his fires. There are several automatic appliances to give warning when the water is getting too low in the boiler, one of the most generally used being a float placed inside the boiler, and connected with a steam whistle. When the water gets too low the float opens the whistle. None of the appliances have, however, come into general use through their liability to get out of order, and if they were depended upon they might prove a source of danger instead of safety. All the taps should be tried several times in each shift, and pipes should be fixed to all of them so as to carry the water clear of the boiler front.

SAFETY VALVE.—The safety valve should in all cases be large enough to admit of the escape of all the steam which can be generated in the boiler without raising the pressure at which the valve is set more than 12 per cent. The safety valve most used is the lever valve. This lever should not press down the valve by a projection welded on the under side of the lever, nor should it be fixed so as to press directly on the top of the valve, but there should be a loose pin under the lever, and secured thereto with a double eye and bolt. The pin should be pointed to fit into a countersink on the top of the valve; it should bear only on the point, and be clear of the countersink everywhere else. This plan does away with the lateral thrust, which is mostly caused by other arrangements. Care should be taken that the pins do not get rusted, that they work freely, and that the guard over the lever (which is placed opposite the fulcrum) does not press on the side of the lever, as is sometimes the case, and an increased pressure thereby put on the boiler. Lever safety valves are easily tampered with, as in many

cases the lever is made much longer than is necessary for the blowing off pressure with the weight provided. Additional pressure is often put on boilers through the engine-driver shifting the weight further out on the lever; to prevent this, the lever should only be of such a length that when the weight is at the end, it gives only the pressure allowed on the boiler. The practice of hanging additional weights on the lever, as is often done, should under no circumstances be allowed, and a good plan is to have a notice fixed in the engine-room, stating the working pressure allowed on each boiler, which should not be exceeded. The necessity for a locked safety-valve is now universally recognised, and those most approved are constructed so as to admit of the valve being moved every day to prevent it from sticking, but no additional pressure can be placed on the valve.

PRESSURE GAUGE.—A reliable pressure gauge, fixed with a syphon, should be placed on every boiler, but the practice of working them for years without being tested, renders a gauge of but little value. I frequently find where two boilers are connected with steam, that the two pressure gauges show a difference of from 10 to 15 lbs., and I am unable to determine which gauge registers correctly, or whether both are wrong. No one knows, in fact. The practice of shifting the weight on the safety-valve lever so as to make it correspond with a pressure gauge, which may be faulty, might put an unnecessary pressure on a boiler which it might be unable to stand. No pressure gauge should be allowed to be in use for a longer period than twelve months without being tested. At the Ballarat School of Mines there is a quicksilver testing machine. The charge for testing and for giving a list of the variations of the gauge from the correct pressure at different pressures, is only 2s. 6d. per gauge. By having a spare one at hand a gauge could be tested at any time, if there were a doubt as to its correctness.

CHECK OR RETENTION VALVE.—Every boiler should have a check or retention valve, and if it be fixed on the top of the shell, it should have a dip-pipe leading down into the water. This pipe should be of such a length that it will deliver the water about one inch below the lowest water level, and a T coupling should be fixed on the end of the pipe. Short pipes should be screwed into each end of the coupling to deliver the water horizontally and distribute it equally. In case an accident happened to the check valve, and the pipe were fixed in the manner I have mentioned, the water could not be blown through the dip-pipe below the top of the tube. This might, however, occur if the pipe were carried down near the bottom of the boiler. The best place in which to fix the check valve is on the front of the boiler, about an inch below the lowest water level.

STEAM STOP VALVE.—A separate steam stop valve should be fixed on each boiler, and when the steam is being turned on to the engine, it should be done slowly. Boilers should not be connected when steam is up until the pressure in each boiler is equal. The water in a boiler should be kept as nearly as possible at one height, and only as much feed should be pumped in as will supply the water used in generating steam, and will allow the boiler to be "blown down" once in each shift. The plan of working the water down low and then turning all the feed into a boiler, should never be adopted, as it prevents regularity of steaming, and causes an unnecessary expenditure of fuel. If more than one boiler is used they should never both be fired at one time. One boiler should always have a good bright fire in it when the other is ready for firing up. By adopting this plan you will be able to keep the steam nearly to the one pressure.

A good driver will always have the water and steam as near to one point as possible.

BLOW-OFF COCK.—In "blowing down" a boiler, the blow-off cock should always be turned backward and forward two or three times before it is fully opened. This prevents it from sticking, as it might do if opened "full" at once.

CLEANSING AND TESTING BOILERS.—Every boiler should be carefully examined inside and outside whenever it is cleansed, and it should be tested by hydraulic pressure once in each twelve months, to not less than 50 per cent. above the pressure at which the safety valve blows off. In doubtful cases, boilers should be subjected to a test of double the pressure at which the safety valve blows off. The best means we have of ascertaining the safety of a boiler with any degree of certainty, is by applying pressure, for even if a boiler be well proportioned, and be made of the best material, there is always the possibility of the existence of defects, such as bad welding or riveting, plates having been burned in flanging, or cracked in bending, or the plates may have been badly punched, and when put together the iron is either cut away so as to bring the holes fair to one another, or the plate is strained by a drift having been driven in the holes to allows the rivets to enter. The rivets may be little, if any, more than half their proper size where the plates join. After a boiler has been riveted the defects I have mentioned can only be detected by a hydraulic pressure test. Some years ago I saw in a boilermaker's yard a boiler, all punched and plated, and ready for riveting—nearly all the holes were half-holes. After the boiler was finished it was tested, and at a pressure of only 70 lbs. per square inch the flue came down. I have seen the gusset stays put in between the double angle irons on the front and the shell with the iron nearly all cut away between the holes and the edge of the plate. These defects could, as I have stated, only be discovered by testing. When the construction of a boiler will allow, it should always be examined and sounded with a hammer before the hydraulic test is applied. All boilers should be thoroughly examined and tested before they are built in position, and I may mention that a hydraulic test and a steam test are equal in pressure and strain on a boiler. Boilers could, however, be constructed which would stand a greater pressure of water than of steam. If a boiler has been resting on damp walls, especially where the dampness results from the use of mineral water, the parts where the boiler has been so resting are often corroded, and the boiler should be carefully examined there. I have seen the plates of a boiler reduced to less than one half-their original thickness, owing to the cause mentioned, while the remaining part of the boiler was in good condition. The chief cause of explosions is the unsafe condition of boilers through age, corrosion, wasting, &c., which necessitates undue working pressure. There are now at work in this State many boilers which have been in use for over 20 years. Some of these boilers have been at work at different places, and have been fed with different waters, and extra care and caution are required in working, examining, and testing them.

STRAIN UPON A BOILER.—To show the amount of strain upon a high-pressure boiler 26 feet long, 6 ft. 6 in. diameter, 3 ft. 6 in. flue, working at a pressure of 50 lbs. per square inch, or 7,200 lbs. per square foot, we have only to multiply the number of square feet of surface exposed to pressure, namely, 863 feet, by 7,200, and we find that a boiler of the dimensions I have given has to sustain a force of 2,773 tons. This calcu

lation is instructive when worked out, as it shows the resisting power required by boilers in daily use, and too much cannot be said about the necessity of engine-drivers giving all possible care and attention to the boilers under their charge.

BUILDING-IN BOILERS.—The best plan in building-in boilers that are fired in the flue is to make them with split flues, and then into the bottom flue, as there will then be the same heat on both sides. With a wheel flue, the side which receives the draught first must be hotter, and will expand more than the side round which it goes before entering the chimney. A boiler should be set with a projection of 4 inches over the front wall, and as little brickwork as possible should be in contact with the shell. The side walls of the bottom flue on which the boiler rests should not have a greater bearing on the boiler than three inches. The side flues should not be higher than the lowest water level, and both side and bottom flues should be large enough to admit of a man going through to clean and examine them. It is a saving of firewood to have all the flues cleaned and swept out once in every two or three months, and the cost of so doing will be amply repaid by the saving in firewood.

FEED PUMP.—An important part of an engine, in connexion with a boiler, is the feed pump. The feed tank should, if possible, be fixed at such a height as will admit of the suction pipe being always full of water. The delivery valve, and check or retention valve and delivery pipe, should have a larger capacity than the suction pipe and valve. This will prevent any undue strain on the various parts of the pump. If more than one boiler is in use, it is a good plan to have a safety valve fixed on the feed pipe so as to prevent it from bursting, which sometimes happens when one ston valve is shut before the other one is opened.

MISCELLANEOUS.—I would strongly urge all drivers to always keep the flue under the fire clear of ashes, and to never let them lie against the front of the boiler. The ashes should be raked away clear of the boiler before water is put on them. When you kindle the fire in a boiler never force it, but let the steam get up gradually. Never blow off a boiler and fill it up with cold water before it has had time to cool. If the water in boiler should get too low, never throw water on the fire before drawing it, but draw the fire in the first instance—then if possible keep the engine at work as long as the steam will drive it, and reduce the pressure in that manner. This is a safer practice than that of lifting the safety valve and allowing the steam to escape suddenly. If the tube is heated, and the water is below the top of the tube, allow it to cool before putting water in the boiler.

* * * * *

The following short instructions to men in charge of boilers are compiled from numerous lists, &c., issued by boards and associations. (These may be divided into three—danger to life of men, danger to life of boiler, and loss in fuel.):—

I.

1. Safety valves. Try valve each morning by hand to prevent it sticking.

2. Water gauges and cocks. Keep the glass half-full if there be no mark on the boiler for water level. Blow through bottom cock about every hour, and the top one twice a day. Too much attention to the water gauge cannot be given.

3. Feed pump or injector. Keep in good order. Make regular inspection. Listen for check valve, and make sure feed is working.

4. Pressure gauge. The gauge should show zero when no steam, and should read the blow-off pressure when valve works. *If it does not,* have it examined.

5. Fusible plugs. Keep clean both furnace and water sides. Change them every twelve months.

6. Short water. If the water has only just gone out of the glass the fires should be drawn at once, and the safety valve eased. Open furnace doors. It is better not to turn on feed, interfere with engine, or lift safety valve until the fire is drawn and the boiler cooled. Then open manhole door and thoroughly examine.

II.

7. Never allow leaks to continue. Have them repaired.

8. Do not empty boiler under pressure. Let it cool down: open blow-off cock.

9. Do not put cold water in or on a hot boiler.

10. Do not allow any dampness in settings or in fire-box.

11. Get up steam slowly. Fire regularly. Use air-holes in door for a few minutes when firing up. Keep a good bed of coals on the bars, and stir up the fire occasionally. Feed at the front, and work towards the back. Black spaces in the fire show entrance of cold air.

12. When laying up for some time, empty right out, and get dry by keeping cocks and holes open to insure a draught, or fill right up, putting in a few handfuls of washing soda. Give outside exposed surfaces a coat of raw oil.

13. Keep all brasses bright. Do not allow any accumulations of ashes, and have no moisture about.

III.

14. Clean out boiler at frequent intervals. The length depends upon the water and the type of boiler. Open hand-holes, and examine inside until necessary period is ascertained. Neither scale inside or soot outside should ever exceed 1-16th inch in thickness. Brush out tubes, and clean out smoke-box regularly.

15. If boiler primes, shut off steam for a while. If dirty water, blow off a few inches, and pump up again.

16. See that no air gets in except through the fire.

17. Blow off every morning when not using steam. Open scum cock two or three times a day while engine is running. See that water is at right level when using scum cocks.

18. Do not use anti-incrustation compounds without due inquiry. If used, put in feed water in small quantities.

OIL ENGINES.

The term oil engine is applied here to engines using heavy oils; that is, in general, kerosene or other oils of .8 or over specific gravity, and with flash points of 100 degrees to 300 degrees. The lighter oils—naphtha, gasoline, &c.—are used in the "motor" types of engine, which are, as yet, not much used by farmers.

The first essential to the economic working of an oil engine is the understanding of the principles on which it works, and of the conditions necessary to insure complete explosion and combustion in the cylinder. The principles vary with the different makes, but the conditions are practically the same for all. The kerosene oil is first vaporized into a hydrocarbon

gas, and then a proper proportion of atmospheric air drawn in by piston is mixed with it. The piston on the backward stroke compresses the mixture, which is ignited by the heat of the vaporizer, by a red hot ignition tube, or occasionally by an electric spark. The ensuing explosion sends the piston forward.

If the engine is running well, the exhaust should be practically colourless; the piston should keep clean; there should be no knocking, and the speed, *i.e.*, the number of revolutions per minute, should be practically constant, whether running light or with full load. The explosions should be regular and uniform, and without a coughing sound. Smoky exhaust, with black sticky piston is a sign of incomplete combustion, due to too much oil, or too little air. In such a case, have a look at the oil-feed valve, and also see that exhaust and air valves are working freely. The exhaust valve is always worth looking at. The next likely source of trouble is the ignition. If a tube, see that it is clean internally, and that it is kept red hot. In the case of the hot wall igniter, there will be trouble unless the compression is correct. This may vary for different brands of oil, so that a change should not be made without a trial run. An incorrect proportion of air will also interfere with the ignition. Perhaps the cause is that the supply of oil is blocked. The vaporizer has to be brought up to the right heat in the first place.

There may be leakage in the rings or piston itself, or in the valves. This will interfere with the air supply. Try if tight by turning engine backward.

Blocking of the oil supply may be due to leakage in pipes or in pump (if supply is raised). The filter in the tank (overhead supply) is a probable source of trouble.

Look out for hot bearings. Lubricate well, and use a good oil. A light oil with high flash and fire tests is the best.

Knocking means worn or loose bearings in the connecting-rod, piston or crank pin end; loose keys; or igniting at wrong part of stroke. The last cause of trouble needs an expert to remedy. For the first, take up bearings by filing; be careful not to make too tight when screwing up.

Draw out the piston occasionally by uncoupling the connecting-rod crank and bearings. Be careful not to break the rings; let piston slide out on to a wooden bed. If necessary, clean well with kerosene both piston and cylinder.

Complete instructions are supplied by the various makers, and can be obtained from them or their agents. They should be carefully followed, and then, with cleanliness and good lubrication, there should seldom be any cause for complaint.

Battery troubles in case of electric ignition need too much space. Broken connexions, dirty terminals, bad insulation of plug, are the chief causes, while the battery may be run down altogether.

MANURE INVOICE CERTIFICATES.

Farmers are advised to retain, for a reasonable time, the invoice certificates supplied to them by vendors when purchasing manures, with the object of assisting officers in the work of protecting farmers from possible imposition.

THE RE-MAKING OF AN ORCHARD.

A. G. Campbell, Assistant, School of Horticulture, Burnley.

Apart from all the efforts that are being made to plant and rear new orchards in several parts of the State, it is interesting and instructive to find that science has been able to reclaim and rejuvenate an orchard which was stated on all sides to have seen its best days. The case I wish to refer to is that of the "Strawberry Gardens," Portland, the property of Mr. T. J. Smith, who states that full publicity can be given to all the statements which follow, in order that the public may know what can be done with discarded fruit trees. When he took over the orchard four years ago, it was admittedly in a very bad state—full of tangled and impoverished growth, harboring untold quantities of codlin moth, mussel scale, and woolly aphis. In fact, its complete destruction was contemplated.

UNPROFITABLE GROWTH OF A PEAR TREE.

EQUALLY UNPROFITABLE GROWTH SECURED BY AN IMMENSE AMOUNT OF CUTTING.

The Means Used.

Mr. Smith writes:—"My orchard, everybody can tell you, was very dirty four years ago; now it is clean, and this season I harvested 1,600 cases of fruit from 2½ acres of fruit trees." Mr. Smith was quick to see that some of the methods explained by Mr. Luffmann, when the State demonstration block at Portland was planted in 1902, would suit his case, and he adopted them. The first year he thinned out with the saw, tons of branches, so that light and air could play more freely in and about the old and diseased trees. The trees were thinned only, especially in the tops, and none of the leaders, or growing points, were cut back at all. By this method the first step was taken towards insuring the growth of fresh fruiting wood throughout the whole length of the branches. Further, the thinning of the old trees allowed access to the spray pump, which was no less an important instrument of succour than the pruning saw.

The trees were at once sprayed with strong salt and sulphur mixture, made on the following plan:—

In a kerosene tin slake 5 lbs. of lump quicklime, add 5 lbs. sulphur, and boil for one hour, keeping well stirred; then in another tin slake 5 lbs. quicklime, and

JONATHAN APPLE, BORE 5 CASES, 1906.

PEAR TREE IN DEMONSTRATION BLOCK, PORTLAND, REFILLED WITH FRUITING WOOD BY THINNING BRANCHES.

GRAVENSTEIN APPLE, BORE 17 CASES IN 1905.

add 3 lbs. salt; mix the two tins, and keep hot. For use, take one part of this and add four parts of hot water: strain well, and apply hot.

This is a splendid insecticide, not only killing all diseases like scale, woolly aphis, and red spider, that harbor on the bark, but cleaning off all moss and lichen growth as well. The new spur and shoot growth that comes in spring has then every possible opportunity of maturing well. Then in November, for the codlin the young fruit was sprayed with a patent mixture, which is practically arsenite of soda, made in the following way:—

In an enamel pan boil 1 oz. white arsenic and 2 ozs. washing soda crystals in a quart of water for about fifteen minutes, stirring well. Pour this on 2 lbs. lump quicklime, and add more water, if necessary, to well slake it. After standing half-an-hour this, when strained, will make 20 gallons of spray.

This spray was given four times, at intervals of nine days. But all through the summer any fruit missed by the spray that was seen to have a grub in, was picked off for the pigs, which also got any infected ones that had fallen to the ground. As the result of this simple but effective

ALEXANDER APPLE, BORE 11 CASES, 1906.

treatment, the old fruiting spurs on the trees became fruitful again, and new spurs showed themselves in the lower parts of the branches.

The winter pruning from this onward consisted of still further thinning the tops of the branches and cutting away any very old spurs that were obviously worn out. The salt and sulphur mixture was again applied, and from then till now the apple scale, which before was a scourge, is very difficult to find. In the following spring the trees were sprayed with 6 lbs. bluestone, 4 lbs. quicklime, 50 gallons of water for black spot, and the trunks bandaged for codlin moth, but the latter pest, it was soon found, is best coped with by spraying, as above indicated, in November, and destroying any grubby fruits wherever found.

THE RESULTS.

Last season the crop taken from the trees, which are mostly apples and pears, but also include apricots and plums, was 1,600 cases of good

fruit, the total number of trees in bearing being 390. This is a splendid, and, needless to say, a profitable return for the labour expended in cleaning and rejuvenating the orchard, and a fine testimony to the value of simple but effective methods of pruning and spraying, which can only be judged by such results. One pear tree bore twenty-three cases of fruit, two apples seventeen and eleven cases each, and several others up to five cases.

Some of the success of this orchard, it must be admitted, is due to the natural conditions obtaining. Artesian water can be tapped at 33 feet in depth, and with two small pipes, let down at the highest part of the garden, an unlimited supply of excellent limy water can be obtained. Mr. Smith says he watered three times last summer, two days each time, allowing the water to run into channels with closed ends.

SUCCESS IN EGG CULTURE.

H. V. Hawkins, Poultry Expert.

As an evidence that duck farming pays when carried out on proper lines, the following may be of interest to readers of the *Journal.* The first agricultural farmers' classes held in Warragul, not quite three years ago, resulted in keener interest being taken in the farming of poultry in that and the surrounding districts. Mr. Donald Grant, of Drouin (a regular student), was one of the first to put into practice the lessons taught at the classes. Having only a small area of land (8 acres), mostly under fruit, he set to work to add to his income by farming ducks for egg production only. He constructed pens of 150 feet x 50 feet, in each a house 6 x 10, made of galvanized iron, with 3 x 2 hardwood for the framework, at a cost of 17s. per house; the fronts all face the east, with wire doors, which are locked at night on account of foxes. Being portable, they are moved occasionally, thus guarding against filth and dampness; the average number of ducks kept in each is forty. One pen, situated on the best undulating piece of land, contains sixty birds, from which he has obtained forty eggs daily all through the winter (when eggs are scarce), and they are still going strong. The birds on the place total 390 ducks, 20 drakes, and 50 fowls, not including the young stock hatched this year, which is in itself a big asset.

The cost of feed, all purchased, for the six months ending 30th September, was £85 9s. 4d. This also included feed for eighty young ducks hatched in July, and also feed for 350 chicks (incubated) for six weeks. The returns amounted to £139 18s. 4d. for the six months, made up as follow:—April, £26 15s.; May, £33 9s. 2d.; June, £18 10s. 6d.; July, £16 4s. 8d.; August, £19 4s. 8d.; September, £25 14s. 5d. Many of the ducks went into a second moult, thus to a large extent spoiling what was promising to be almost a record; they fell away to seventy-two eggs a day at the latter end of June, and at the early part of July most of them had a month's spell. The greatest number of eggs gathered in one day was 368 on 18th September, and the total for the six months amounted to 2,905 dozen, or 34,860 eggs.

The manure alone is of considerable value to his orchard, and should find a place in the balance-sheet of every farmer. Its value is of the highest order, the more so on account of the manner in which the ducks are fed—*i.e.*, on a highly nitrogenous ration, which is the only one to produce eggs in abundance. Ducks, like fowls, must have the raw material, by which they can convert one form of food into another, viz., eggs or flesh. Even with green food, the *best* was used right through—*i.e.*, lucerne chaff, purchased by the cwt. from Bacchus Marsh; this fodder is of double value to any other grass, being so rich in proteids. Pollard, bran, and dry blood (best obtainable), with a handful of salt, two or three times a week, was the principal food given; and in extreme cold weather a handful of maize was fed midday. Ducks, like fowls, must be given more than a mere subsistence ration if we expect them to return us any product over and above maintaining simply an existence. This has been Mr. Grant's experience, and scores of others who have put into practice the lessons taught at the short-course classes to farmers and their sons and daughters.

If eggs are desired, an excess of proteids must be fed; a duck or fowl should no more be fed on wheat alone than a man on bread alone. The universal need of a mixed diet is applicable to the ducks or fowls as well as to those in whose care and keeping they are. For example, in ½ oz. of wheat there are, roughly speaking, six one-hundredths of an ounce of protein, but an egg contains ¼ oz. of protein. Under these conditions, there is then available for each day *only* one-fourth of the protein required for each egg. Then, as to the other constituents, the ½ oz. of wheat referred to contains one and a half as much carbohydrates and fat as the egg contains. In short, the hen or duck is supplied with enough carbohydrates to make an egg and a half a day; but, mark you, she has only enough protein to make one single egg in four days. Wheat and maize are therefore one-sided rations, the latter especially so, being much too rich in fats, and as a consequence predisposes the hen or duck to lay on internal fats. No grain by itself can produce eggs; hence the great necessity to feed ducks and fowls on a mixed diet, or a properly balanced ration, as I have described to students at the agricultural classes, and which Mr. Grant and others have amply proved by actual test. Even in cold Drouin poultry-farming will add materially to the farmer's and fruit-grower's income. It requires intelligence and a thoughtful overseer, and success will follow the enterprise.

Mr. Grant, in his letter to me, says, "I am satisfied poultry-farming pays when treated properly." Each day the eggs are gathered, graded, and at once packed in special divisional boxes. The boxes are forwarded direct to the agent, and returned empty; scarcely any breakages occurred throughout the season. Another element in the success achieved by Mr. Grant is the fact that he sticks to one agent, which creates mutual confidence, and results in top prices being obtained.

SUPPLEMENTARY LIST SHOWING RESULTS OF ANALYSES OF SAMPLES OF ARTIFICIAL MANURES COLLECTED IN THE STATE OF VICTORIA UNDER THE PROVISIONS OF THE ARTIFICIAL MANURES ACT.

Description of Manure.	Manufacturer or Importer.	Nitrogen.		Phosphoric Acid.								Potash.		Estimated Value per Ton.
				Water Soluble.		Citrate Soluble.		Insoluble.		Total.				
		Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	£ s. d.
Superphosphate, Ordinary ..	P. Rohs, Bendigo	..	..	19.69	18.00	1.51	1.50	0.44	1.50	21.64	21.00	..	..	4 15 0
Superphosphate, Wischer's ..	Wischer and Co., Melbourne..	..	..	18.94	18.00	3.56	1.50	0.57	1.50	23.07	21.00	.	..	5 0 0
" " ..	" " " ..	..	..	17.50	18.00	1.68	1.50	3.48	1.50	22.66	21.00	.	..	4 8 10
" " ..	" " " ..	..	..	19.14	18.00	1.44	1.50	2.22	1.50	22.80	21.00	..	..	4 11 0
Superphosphate, Federal O. S.	Australian "Explosives and Chemical Coy. Ltd., Melbourne	..	..	18.70	18.00	0.45	1.50	2.49	1.50	21.64	21.00	..	..	4 8 6
Superphosphate, Florida ..	Cuming, Smith, and Co., Melbourne	..	..	18.49	18.00	1.05	1.50	1.75	1.50	21.29	21.00	..	..	4 9 1
" " ..	" " " "	..	..	19.17	18.00	0.65	1.50	0.86	1.50	20.68	21.00	..	..	4 9 8
" " ..	" " " "	..	..	19.23	18.00	1.00	1.50	0.63	1.50	20.86	21.00	..	..	4 11 1
Superphosphate, Hasell's Jap.	A. H. Hasell, Melbourne ..	..	..	19.67	18.50	2.14	1.50	0.13	..	21.94	20.00	.	..	4 17 2
Superphosphate, No. 1 ..	Mt. Lyell M. and R. Coy., Melbourne	..	..	19.80	18.50	0.86	1.25	1.28	1.00	21.94	20.75	.	..	4 13 9
Superphosphate, Ovens Improved	Strachan, Murray, and Shannon, Geelong	..	..	16.74	16.51	1.73	1.85	0.21	..	18.68	18.36	..	..	4 2 5
" "	" " "	..	..	16.80	16.51	1.97	1.85	0.13	..	18.90	18.36	..	.	4 3 7
Superphosphate, Federal Nitro	Australian "Explosives and Chemical Coy., Melbourne	*1.00	0.98	12.96	13.50	2.77	0.20	0.55	1.20	16.28	14.90	..	..	4 1 11
Superphosphate, Nitro ..	Wischer and Co., Melbourne..	†0.61	0.75	15.80	12.86	1.52	2.10	2.95	4.22	20.27	19.18	..	..	4 12 2
" " ..	Cuming, Smith, and Co., Melbourne	†1.18	1.00	9.21	10.01	5.09	3.88	5.66	5.48	19.96	19.37	..	.	4 10 9
" " ..	" " " "	†1.22	1.00	8.97	10.01	5.11	3.88	5.97	5.48	20.05	19.37	..	..	4 11 1
" " ..	" " " "	†1.14	1.00	10.47	10.01	4.18	3.88	5.12	5.48	19.77	19.37	..	..	4 10 10
Superphosphate and Bonedust	Mt. Lyell M. and R. Coy., Melbourne	†1.25	0.80	14.32	12.00	2.69	3.00	4.76	4.00	21.77	19.00	..	..	5 2 2
" "	Cuming, Smith, and Co., Melbourne	†1.22	1.50	7.29	7.50	8.81	5.00	5.40	8.50	21.50	21.00	..	..	4 16 8
" "	" " " "	†1.51	1.50	7.48	7.50	7.17	5.00	6.89	8.50	21.54	21.00	..	..	4 18 5
Mixed Manure, No. 2" ..	Sheaf Brand Artificial Manure Coy., Melbourne	‡0.74	0.60	4.28	7.00	5.52	3.00	0.70	..	10.50	..	0.50	0.50	2 15 3

* As blood. † As bone. ‡ 0·40 as ammonia and 0·34 as bone.

SUPPLEMENTARY LIST SHOWING RESULTS OF ANALYSES OF SAMPLES OF ARTIFICIAL MANURES, ETC.—*continued.*

Description of Manure.	Manufacturer or Importer.	Nitrogen.		Phosphoric Acid.								Potash.		Estimated Value per Ton.
				Water Soluble.		Citrate Soluble.		Insoluble.		Total.				
		Found	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	£ s. d.
Grass Manure	Mt. Lyell M. and R. Coy., Melbourne	..	..	6.58	7.00	10.65	11.00	3.44	1.00	20.67	19.00	1.16	1.00	4 8 9
Potato Manure	Cuming, Smith, and Co., Melbourne	*0.79	1.00	15.58	15.50	1.67	0.50	1.21	1.00	18.46	17.00	3.61	4.00	5 11 6
" "	" " "	†0.90	1.06	8.85	8.21	6.81	3.63	4.00	5.53	19.66	17.37	4.85	5.20	5 15 11
" "	" " "	*‡1.06*	*1.06*	*8.31*	8.21	7.20	*3.63*	*4.29*	*5.53*	*19.71*	*17.37*	*4.80*	*5.20*	*6 0 8*
Onion Manure	" " "	§1.44	1.55	13.16	14.40	0.96	1.20	3.80	1.20	17.92	16.80	5.66	6.00	6 6 11
Orchard Manure	" " "	‖1.45	0.55	14.33	12.83	3.23	0.86	1.64	1.97	19.20	15.66	5.80	5.00	6 13 10
Thomas Phosphate, H. and E. Albert's Brand	Welch, Perrin, and Co., Melbourne	..	..	..	..	13.91	13.46	2.20	2.14	16.11	15.60	..	..	3 2 2

* As ammonia. † 0·70 as bone and 0·20 as nitrate. ‡ 0·91 as nitrate and 0·15 as bone. § 1·30 as nitrate and 0·14 as bone. ‖ 0·93 as nitrate and 0·52 as bone.

Description of Manure.	Manufacturer or Importer.	Nitrogen.		Phosphoric Acid.		Mechanical Condition.				Estimated Value Per Ton.
						Fine.		Coarse.		
		Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	£ s. d.
Bonedust	P. Rohs, Bendigo	3.87	4.09	19.87	21.60	38.16	37.65	61.84	62.35	5 4 9
Bone Manure ..	A. E. Kleiner, Wangaratta	3.18	4.08	20.74	20.85	33.16	..	66.84	..	5 0 8
" ..	" "	5.57	4.08	17.17	20.85	31.83	..	68.17	..	5 10 11
" ..	" "	3.38	4.08	21.58	20.85	16.81	..	83.19	..	5 0 7
Bonedust	P. Rohs, Bendigo	4.11	4.09	19.36	21.60	36.15	37.65	63.85	62.35	5 4 4
"	Cuming, Smith, and Co., Melbourne ..	2.58	2.50	21.78	21.00	37.76	35.00	62.24	65.00	4 18 0
"	" " " ..	*2.76*	2.50	*20.63*	*21.00*	*34.84*	*35.00*	65.16	65.00	4 15 5
"	Executors J. Brown, Hamilton ..	3.87	2.50	22.78	24.20	36.90	..	63.10	..	5 15 2
"	J. R. Jopling, Ballarat	4.24	3.97	20.19	20.65	20.27	18.45	79.73	81.55	5 5 10
"	Waddell and Co., Kensington	2.69	3.00	16.70	17.00	34.60	26.00	65.40	74.00	4 3 0
"	Wischer and Co., Melbourne	*3.88*	*3.00*	*19.87*	*18.25*	*30.06*	*30.00*	*69.94*	*70.00*	*5 4 0*

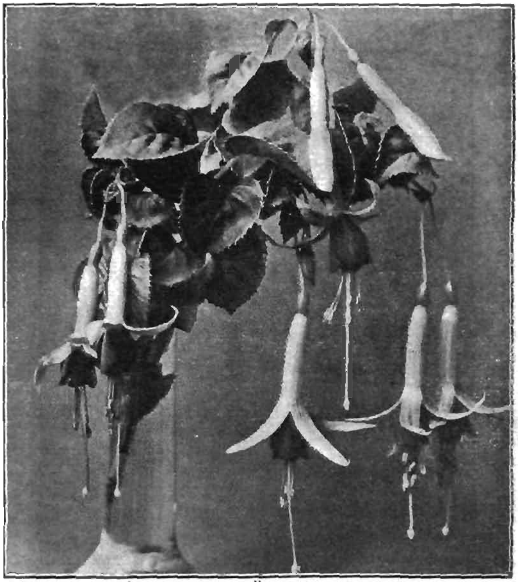
W. PERCY WILKINSON, Acting Chemist for Agriculture.

GARDEN NOTES.

J. Cronin, Inspector, Vegetation Diseases Acts.

The Fuchsia.

Fuchsia is a genus of perennial dwarf shrubs, and climbing and trailing plants, with few exceptions, originally natives of Central and South America. The first species introduced into England was *Coccinea* from Chili in 1788, after which none were received until 1823, when *gracilis*



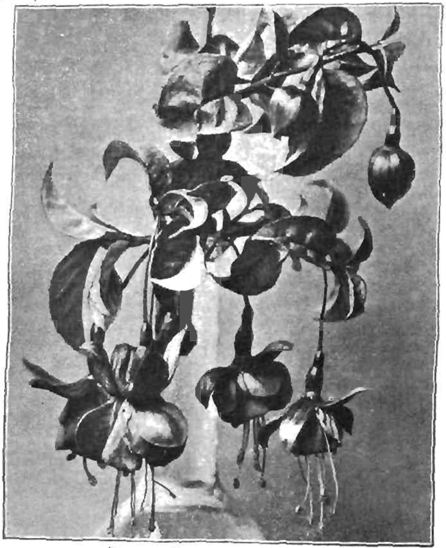
"MRS. G. RUNDLE." SINGLE COROLLA.

was introduced. Several other species followed during the next few years, and the plants, being easily cross-fertilized, and seedlings easily raised, the present type of garden fuchsia was created. A number of the original species is still considered worthy of cultivation; except in the size of the individual flowers, many are quite equal to the florists' varieties in value as decorative plants for conservatory or open border. Fuchsias are easily grown when the conditions are suitable, and are again becoming popular plants. A few years ago finely-grown specimens were

often seen at horticultural exhibitions, the plants being of large size, symmetrical shape, and covered with flowers. For pot culture, for greenhouse or verandah decoration, the fuchsia is excellent, the plants producing their beautiful pendulous blossoms for a long time under fairly moist conditions. Many varieties are suitable for basket culture or trailing plants, the foliage of a few being also variegated or golden coloured.

CULTURE.

A rich sweet loam is the most suitable soil for fuchsias, either when grown in pots or open border. For pot culture the soil should be fairly



"CREUSA." DOUBLE COROLLA.

porous, the addition of sand, leaf-mould, and well-decayed cow manure effecting the purpose. The soil for potting should not be pulverized, a rather coarse soil being preferable. The soil should be firmly pressed around the plants when re-potting, as a loose soil produces gross rank growth. Plants grown in pots should not be allowed to become pot-bound, but should be placed in larger pots before the roots become entangled around the sides of the pots. Vigorous plants growing freely may be re-potted into pots two sizes larger than those they occupy, weaker

growing ones into pots one size larger. Plants, except when grown under green-house or conservatory conditions, should not be re-potted during winter. For the open border, shade and shelter from hot winds are of first importance. A southerly or easterly aspect is most suitable. If the soil staple is of a sandy hot nature, clay and cow manure should be liberally added, and the plants should be mulched and watered freely during very dry hot weather.

Pruning consists chiefly in pinching during the growing season, to keep the plants in shape; a pyramidal form is most suitable for the majority of varieties, enabling the whole of the blooms to have ample room for development. During winter fuchsias grown in open borders lose most of their foliage. These plants may be pruned back in spring, when growth is commencing.

Existing varieties are propagated from cuttings inserted in spring in pots or boxes containing well drained sandy soil. Nurserymen increase their stock by placing the old plants in heat, and as small young cuttings develop, they strike them in a frame or hot-house. Cuttings of the ripened growth are easily rooted in the open ground, but the young growth is always preferable. New varieties may be raised from seed. Seed is often freely produced on plants in the open garden. No improvement in variety is likely unless well-marked and fine varieties are used as seed parents, and hand fertilized. The process is simple. The male organs, the stamens, should be removed from the variety selected to bear seed, and pollen from the variety selected for crossing should be applied to the stigma with a camel hair brush. The seedlings are easily raised, and may be grown in pots for a while, and afterwards planted out in a shady border.

Varieties.

A few of the original species are procurable in local nurseries, including *corymbiflora*, *gracilis*, *splendens*, *triphylla*, and *procumbens*. The latter is of trailing habits of growth.

Varieties with double corolla:—Avalanche, Countess of Hopetoun, Jubilee, Mrs. E. G. Hill, Phenomenal, Edmond About, Creusa, Molesworth, Mr. Gladstone, Christolphe Colomb, Madame Jules Chretien.

Single corolla:—Mrs. Marshall, Mrs. G. Rundle, Leda, General Roberts, Harlequin, Irma, Mrs. G. Ditton, Countess of Aberdeen, First of the Day, Sunray, Wave of Life, Earl of Beaconsfield.

Flower Garden.

The most important work is the conservation of moisture in the soil, and the application of water where necessary. As frequently stated in these notes there is no more necessary work during summer than the frequent disturbance and pulverization of the surface. The hoe or cultivator should be used as often as possible, especially after rain or watering, causing the production of an earth mulch 2 or 3 inches deep. Established plants will require little water under such conditions, except during periods of severe heat and drought, or in exceptionally dry places. The value of thorough drainage may be seen at this season. Roots of plants growing in sweet well-drained soil penetrate to a much greater depth than those that are growing in soil water-logged

in winter and spring, and are thus enabled to acquire moisture and plant food from a much greater depth and area, being also less liable to suffer from fluctuations of temperature. Water should be applied in sufficient quantity to moisten the soil thoroughly, and the surface near the plants should be either mulched or broken up finely with the hoe while drying.

Newly-planted dahlias and other tender plants will require special attention in watering, shading, and cultivating, until thoroughly established and growing freely. Dahlias should be mulched with long manure, and securely staked as growth progresses. An occasional syringing or overhead sprinkling in the evening of days of great heat, will benefit the plants, and also check red spider, the principal insect enemy of the dahlia.

Chrysanthemums grown for exhibition blooms should not be allowed to suffer from lack of moisture during hot dry weather. Under ordinary weather conditions, if the beds are well drained and properly prepared, hoeing the surface occasionally is sufficient to keep the plants growing steadily. The plants will probably produce a bud in the points of the shoots, and break into lateral growth about the middle of January. This bud is known as the first crown, and should not be saved. All shoots but the leaders should be removed, and great care taken that these are not damaged by caterpillars, &c., as on these shoots the finest blooms are produced. Buds will show in the points of those shoots from early in February till the end of the month. The flower bud is rounded, and occupies the centre of the shoot, being accompanied on either side by growth buds. The latter should be removed as early as possible without damaging the flower bud, which is known as the second crown bud. No liquid manure should be applied to plants in prepared beds before the end of February.

Carnations may be increased by layering the growth after the flowering period. The layers root readily in light soil well supplied with moisture. Flowering shoots should be removed from plants of tree carnations designed to bloom in winter.

Seeds of pansy and Iceland poppy should be sown at end of January to supply plants that will flower early in winter. A special shade or cold frame should be provided, and the seed sown in light soil in boxes, or in shady borders. One of the best strains of pansy procurable is Bath's "Empress." A fair proportion of finely marked fancy varieties of large size may be expected. Iceland poppies are easily grown, and are specially valuable during winter and spring for garden decoration, or as cut flowers. A new strain producing flowers of various shades of pink is advertised, and should be worthy of a trial. The colours of the older varieties are white, yellow, and orange.

Ground should be prepared for the reception of bulbs and corms of winter and spring blooming plants, such as Narcissi. A late batch of corms of gladioli may be planted for autumn blooming; the ground should be deeply worked and well manured for their reception. Gladioli that are showing flower spikes should be staked and liberally watered.

Kitchen Garden.

As in the flower garden, the principal work should be the maintenance of a moist soil, and watering where necessary. Land should be prepared for future cropping as soon as cleared of crops. A liberal dressing of

stable manure should be incorporated and thoroughly mixed through the soil.

The best way to raise a stock of herbs, such as sage, thyme, and marjoram, is to procure a few plants and propagate them by divisions or cuttings. Seeds of several herbs, including those mentioned, are procurable from Melbourne seedsmen, and may be raised with little trouble, but are some time coming to maturity. They would require careful culture during the first season. Old plants may be divided during autumn, and planted in rows to admit of horse or wheel hoe cultivation if a quantity is required. The land should be drained, well worked, and manured before being planted, after cultivation being digging or ploughing between the plants in winter, and cultivating well in summer. A moist, but sweet, situation is most suitable.

Beds should be prepared for the reception of seeds, and seeds of turnips, cauliflower, French beans, peas, and various saladings should be sown. Early varieties of potatoes may be planted for an autumn crop, and also plants of cabbage, celery, &c., from former sowings.

NHILL FARM COMPETITION, 1906.

F. E. Lee, Agricultural Superintendent.

REPORT TO THE SECRETARY, NHILL AGRICULTURAL SOCIETY.

Having accepted the position of judge in such an important competition, it may be of interest to define the aspect from which I investigated all the matters brought under my notice. Impartiality may be taken for granted, the object in view being to determine which of the competing farms or crops I would have selected had I been offered a choice of the whole lot in each section. Criticism of the details appertaining to each farm is reflected in the points awarded, but it is hardly necessary to observe that criticism does not by any means imply disparagement.

There were doubtless good reasons which prevented some of the competitors from showing their farms to the best advantage, but with these a judge has nothing to do; he makes his awards to the best of his ability on the facts actually presented. In the judgment of wheat crops, the previous weather conditions must be taken into account, and some discrimination should be made for soil differences. During the whole inspection there were only two crops which were found impossible to walk through on account of boisterous weather, all others were thoroughly investigated on foot.

BEST FARM OF OVER 640 ACRES.

In this section there were only three competitors, Mr. Joseph Morris withdrawing prior to inspection. The points awarded are as follow:—

Name.	Address.	A.	B.	C.	D.	E.	F.	G.	H.	I.	J.	K.	Total.
J. Dufty & Son	Lorquon	12	10	2	7	12	15	20	10	10	30	20	148
G. Batson ...	Haycroft	14	10	5	9	14	12	16	8	9	25	18	140
G. Crouch ...	Kaniva	13	8	2	8	12	14	17	9	6	25	16	130

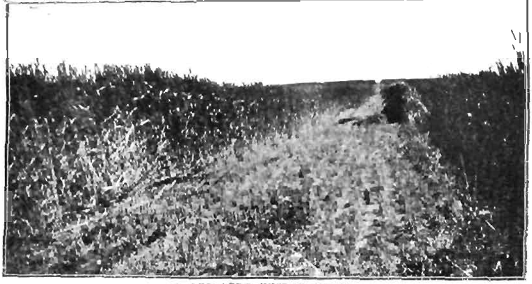
It appears to me, that as a matter of general interest, the above-mentioned awards are worthy of more detailed analysis.

(*A*) *The Best System of Cultivation, Rotation, etc., pursued on each Farm—15 Points maximum.*—The three competitors are very close to one another; Mr. Batson, by reason of the efforts he has made by means of rape and rye grass, shows enterprise in providing feed for his sheep, and incidentally introducing a much needed break in continuous cereal cropping.

The large areas held by competitors in this section enables them, after a crop of wheat followed by oats, to leave the land out in grass for several years, a system which contributes materially to the cleanness of the subsequent wheat crop.

The system of cultivation, that is to say, the manner in which the cropping and fallowing are done, is much the same in all cases. It may be remarked that the large areas cropped are responsible to some extent for the fallowing being done on the late side, which in a dry year is a drawback.

(*B*) *The Best System of Manuring the Land, Names of Manures, and Quantities used per Acre—10 Points maximum.*—The use of superphosphates of various brands is universal.



A 350-ACRE WHEAT CROP.

The particular name of the manure carried no weight with me whatever, but I learned with satisfaction that the approximate weight per acre used now is nearer 56 lbs. per acre than it was in 1903 when I judged previously. In all cases a little extra manure was given on red ground than on black ground. The use of stable refuse on poor patches is a practice to be commended. I am well aware that many practical northern farmers refuse to recognise the value of stable refuse, but if one reflects that this material controls the power of the soil to hold moisture more than anything else, its value will soon be admitted. Well-rotted material, such as comes from a covered pit, is not only easy to handle and spread, but has not the drawback of keeping the soil open and dry, nor does it spread weed seeds.

(*C*) *The Best System of Saving Stable and other Manures on each Farm—5 Points Maximum.*—In this section a great deal more could be said of what has not been done, than of what actually takes place. It will be noted that Mr. Batson is the only one of the competitors who receives full points. The curiosity of the visitors who accompanied the judge was in

itself sufficient evidence of the fact that nowhere else in the district was there any similar attempt made at conservation. The addition of a few handsful of gypsum scattered about the stalls would absorb and fix the liquid manure, thus preventing the escape of the most valuable portion of it, viz., the ammonia.

As a top dressing for grass land, for mulching purposes, in the vegetable and flower garden, and in the orchard, the stable refuse is well worthy of every farmer's attention, no matter how large or small his holding.

(*D*) *The Best and Cleanest Growing Crop—10 Points Maximum.*—In this item there remains not much else to be said than that the crops were uniformly good, and almost as uniformly dirty. The presence of the wild oat is easy enough to detect at this time of the year, and it is to be seen everywhere. I might remark that while the wild oat thrives as well as it does on the roads, there is little hope of keeping it out of the fallow and cropped paddocks. One feature of the crop is worth noting here, viz., the prevalence of barley and foreign wheats. Hardly one field is

WHEAT EN ROUTE FOR THE RAILWAY STATION.

free from these impurities, and in some cases it is particularly marked. It the foreign varieties ripened at the same time as the bulk of the crop, little harm would be done, but as they invariably mature earlier, they are of no other value than as contributors to the rubbish already in the ground.

(*E*) *The Best System of Fallowing and Working of Fallow—15 Points Maximum.*—In this section, I found that this season, no very high standard could be set for the fallow. The winter has been unusually wet, so that a great portion of the fallow is grassy, solely on account of the impossibility of putting implements and horses on it. The conviction that the fallow system is the only possible one in northern wheat farming is now so strongly rooted that there is no necessity to refer to its advantages. The difficulty experienced in working the fallow is evident from the low

condition of many of the farm horses. Frequent cultivation will be necessary during the coming summer if the fallow is to be kept in anything like good order.

(F) The Best and Most Profitable Classes of Live Stock kept on each Farm—15 Points Maximum.—I regard this item in the farm competition as being of the very highest importance, because on the well being and utility of his farm stock the wheat farmer is entirely dependent.

Horses.—As the points indicate, the horses shown by all competitors were of good class. Messrs. Dufty and Son's fine mares and foals, as well as the general excellence of their other horses, deservedly rank first. Mr. Crouch is also the possessor of some particularly fine animals, well suited to their work. Mr. Batson's horses are a more mixed lot, good useful sorts, but hardly showing the same quality as the others.

Sheep.—The establishment of the lamb industry has already made its mark on the class of sheep kept by farmers in the Wimmera. The Shropshire on cross-bred or come-back ewes seems to be the most popular line of breeding for big-framed, early-maturing lambs. Judging from the prices realized for lambs already sold, there must be a good margin of profit in lamb raising in the Wimmera, and too much care cannot be taken in maintaining the sound lines on which the industry is being conducted. I might here point out the value of rape as an adjunct for lamb fattening, and also of ensilage for feeding breeding ewes. Overstocking is perhaps the greatest trouble likely to eventuate in the future, but the previous experiences of northern farmers ought to make an annual insurance in the way of fodder reserves imperative.

Cows, Pigs, and Poultry.—As adjuncts to the farm, these three classes of stock are of the highest economical importance, not only for the milk, butter, bacon, and eggs they furnish, but also as the medium for the utilization of a great amount of feeding stuff that would otherwise go to waste. I can conceive no farm so badly equipped and conducted as the one which does not include the above-mentioned domestic stock.

(G) The Best Implements and Machinery kept and used on each Farm—20 Points Maximum.—From the purely agricultural aspect, the factor which controls the productiveness of the soil as much as anything else, is the class of implements used. Speed, durability, and efficiency are the three things demanded in a farm implement. The improvements in implements have made such great strides within the last few years that nowadays the pattern of a few years back is almost obsolete to-day. To keep pace with the times in the matter of implements needs money, but I am glad to say that I saw little to criticise in this respect among the larger farms. Messrs. Dufty and Son's farm equipment is, I think, the most comprehensive I have seen for a property of its size. In addition to this the services of a blacksmith and wheelwright are permanently employed, and besides all mechanical repairs, most excellent waggons are made on the place. This fine property, situated as it is some 18 miles from Nhill, is compelled to be independent of the busy country mechanic, and it is most pleasing to see the well furnished smithy and shop. Messrs. Batson and Crouch are well equipped in all the ordinary farm implements, but living nearer to the town, their repairing outfit is not such a prominent feature. I might remark that in no farm, inspected by me, was there any evidence that in the "off season" the implements served the purpose of hen roosts, nor were the angles of the paddocks the resting place for derelict machinery, as is unfortunately too frequently the case.

(*H*) *The Condition and System of Fencing—10 Points Maximum.*—One feature of the competition continuously being brought under the judge's notice is the condition of the fences and particularly the gates. The development of the sheep industry and the well-known propensities of the crossbred sheep to ramble has had the effect of bringing about an improvement in this direction. The majority of the boundary and subdivisional fencing is sheep proof, viz.:—5 or 6 wires and a barb wire.

Messrs. Dufty and Son's light and simple home-made gates call for especial notice. Messrs. Crouch and Batson, both of whom have recently added to their properties, are not so well off in this respect.

(*I*) *The Best Kept Kitchen Garden and Orchard—10 Points Maximum.*—The housewife, for the most part, is more responsible for this detail than the farmer himself. It is, I am glad to state, a noticeable feature of each farm under review. Messrs. Dufty and Son and Batson have water laid on to their gardens and orchard, and are thus independent of the season. As a consequence, one finds flourishing not only all the common kinds of vegetables and fruit, but a growth of gay flowers as well. The utility of the garden is, to my mind, one of its minor attributes on a farm. There is nothing more refreshing to the eye, and perhaps more elevating to

DAIRY COWS IN THE WIMMERA.

the senses as well, as the appearance of a trim, well kept garden, reflecting the love of the beautiful and the enthusiasm of the ladies of the establishment. The visitor notices these things, perhaps, more than the owner does, and nothing adds more to the pleasure of a visit than the general attractiveness of the homestead.

(*J*) *The best Provision for a Water Supply.—30 Points Maximum.*—There is nothing more educative in this direction than the lesson of a severe drought. Water is the one thing which all life, whether human, stock, or vegetable, cannot do without. The plans of each property, furnished at my request, indicate that the farmers of the Nhill district are fully alive to the advantages of an adequate water supply. Unprovided by channels to depend upon should an unexpected dry spell arise, the chief source of supply comes from dams. The sites of these have been well chosen as regards catchment, and facility of use. Windmills and watering troughs, especially on Messrs. Dufty and Son's property, expedite the watering of stock and prevent needless fouling of the water. At the present time all the dams are brim full, so that their holding capacity in dry

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weather could not be gauged. In allotting the maximum number of points in this section to Messrs. Dufty and Son, I do not wish to imply any lack of provision on the part of Messrs. Batson and Crouch, but the former gentlemen have more windmills and troughs on their property, and their dams are, if anything, of slightly larger capacity and better located than in the two latter cases. The domestic or house supply of water is a matter that calls for comment. However good dam water may be the catchment from an iron roof is better for human drinking and cooking purposes; in each case ample provision is made for a house supply, by means of the ordinary galvanized iron and underground tanks.

(*K*) *Best Arrangement and System of Dwelling and Farm Buildings—20 Points Maximum.*—In this detail Messrs. Dufty and Son are better situated than the other competitors. A typical farm homestead, commodious and well furnished, surrounded by its garden and orchard, shaded by well grown trees, easy of access to the farm outbuildings, it would be difficult to find a more useful or elegant home. Mr. Batson's homestead is on a smaller scale, but of no less attractiveness, while that of Mr. Crouch—both inside and out—reflects the progressive farmer.

In the matter of outbuildings, Messrs. Dufty and Son have, perhaps, the greatest number, but in construction and design there is little to choose between the competitors. Large pole sheds, with thatch roofs, are without doubt serviceable, cheap to construct, cool, &c., but they cannot by any stretch of imagination be called elegant. To my mind, this class of farm outbuilding represents a *régime* that is past, and where it is possible to do so, they might with advantage be replaced with more modern buildings with iron roofs and latticed sides.

The planting of sugar gums about the yards and the excavation of a pit for the stable manure are two matters worthy of attention. A silo for the conservation of surplus green feed, or else to be used for storage of chaff or grain should be an additional feature to every homestead in the Wimmera.

BEST FARM OF OVER 100, BUT NOT EXCEEDING 640 ACRES.

There were only 3 competitors in this class, which is to be regretted, as there are any number of farms which could conform to the conditions. On the small farms the judge does not look for the same scope of operations, nor does he expect to find the same outlay in machinery, stock, &c., as is demanded in the larger farms—hence the number of competitors should be larger. It is not always the size of a man's operations that places him in the front of his neighbours, but rather the general manner in which the property is worked.

The details on which the awards were made are identical with those ruling for the large farms:—

Name.	Address.	A.	B.	C.	D.	E.	F.	G.	H.	I.	J.	K.	Total.
C. Voigt ...	Haycroft	10	8	1	10	13	11	18	9	10	25	18	133
E. Fritsch ...	Winiam	11	9	2	7	13	12	16	8	9	24	20	131
C. Sherwood	Haycroft	12	9	2	7	12	13	16	9	8	26	16	130

It will be noted that while the total number of points is very close, each competitor in one detail or another is ahead of the others. For example, Mr. Voigt only gets 10 points in (*A*) because the bulk of his crop this year is being carried on elsewhere on shares. He beats the other two competitors in the number and class of implements, and also for the best kept garden and orchard. Mr. Fritsch is given the highest points for his homestead and buildings, but only received 7 points for his crop, which is very dirty. Mr. Sherwood leads for the best system of cultivation, rotation, &c., the best stock, and also for the best provision for water supply, but he is low down for the crop and also for the garden and dwelling.

In coming to a decision for the small farms, I am largely guided by the general circumstances of each property and the evidences of progressive ideas shown. For example, Mr. Voigt has a small stack of ensilage which he will find valuable later on; his two small orchards are models of cleanness, and the trees are healthy. The bacon curing house, smithy, and grain barn all point to up-to-date ideas. Mr. Fritsch has a well-equipped smithy, his stable is roofed with iron, and the water conserved. Mr. Sherwood has recently had a windmill erected, and supplies his house and garden with water. His sheep dip is shared in conjunction with a neighbour.

CUTTING ALGERIAN OATS FOR HAY.

All of these three farms are admirable examples of what can be done by industry and enterprise, and the owners are to be complimented on the lines of work they forecast for the future.

THREE-FOURTHS OF FARMERS' WHEAT CROP ON FALLOW LAND.

In this section, there were 10 competitors, representing north, south, east, and west of Nhill. Unfortunately, Mr. Crouch, of Kaniva, was compelled to withdraw his crop on account of its having been beaten down by a heavy storm. In awarding points, I have adopted the following standards:—

Cleanness 10 points, trueness to type 10, freedom from rust, smut, whiteheads, and "take all" 10; apparent yield 1 point for each bushel.

Name.	Address.	Cleanness.	Trueness to type.	Freedom from Disease.	Apparent yield.	Total.
					Bushels.	
Couzens and Ward ...	Nhill ...	9	9	9	23	50
H. A. Dahlenberg ...	Salisbury	9	8	9	23	49
C. Voigt and Son ...	Winiam ...	8	9	9	22	48
G. Batson	Haycroft	9	9	8	21	47
J. Morris	Yanac ...	8	9	9	20	46
J. Bond	Broughton	8	9	8	20	45
D. Morris	Yanac ...	7	8	7	17	39
T. Ervin	Kiata ...	7	8	8	14	37

As these crops represent the best ones in the district, there is very little to choose between them. The wet winter has been responsible for a great many patches in which the wheat has died out altogether, occasional small areas of "take all," and the widespread presence of whiteheads, all combined will, I fear, reduce the sanguine estimates that many farmers have made of their crops. Six and seven-bag crops are exceptionally good ones at any time, and it is unreasonable to look for such high averages from a large area.

The prevalence of whiteheads through every crop calls for scientific investigation. Mr. D. McAlpine, vegetable pathologist, states that "take all and whiteheads are both different stages of a diseased condition of the wheat plant, caused by one and the same fungus, which occurs at the base of the stem and on the roots." The fungus is further stated to be found on spear grass, the destruction of which is recommended as a means of mitigating the disease. Time did not permit me to observe closely enough if any one variety of wheat appeared more subject than another to this pest, but the opinion was frequently expressed by farmers in my hearing that the Purple Straw varieties were the most liable.

The invasion of many of the wheat crops by the small white daisy is due no doubt to the seed blowing in from the roadside. It appears, however, to me that the daisy is much more prevalent throughout the district than when I judged the crops in 1903.

Those paddocks which have been out of cultivation for eight to ten years are, as might be expected, much freer from wild oats than those which have been more frequently cropped. In my opinion, the wild oat is the farmer's friend, just as much as his foe, and provided the farm practice permits the fallow being kept clean by sheep, there is little to be feared from the wild oat. If the silo becomes firmly established in the north, the wild oat will form one of the cheapest fodders for ensilage.

THE BEST 100 ACRES OF WHEAT GROWN ON MALLEE LAND.

This section, which I understand is a new departure since last year, brought out ten competitors. The same standards were adopted in judging the crops, but the kind of Mallee, length of time under cultivation, and appearance of "shoots" were also noted. The points awarded are shown on the opposite page.

The Mallee crops are uniformly good as regards yield, but the paddocks are many of them badly infected with whiteheads. It must be remembered that I only judged the picked 100 acres out of the whole crop

in each case, and the remainder as a rule was much poorer both in yield and cleanness.

Name.	Address.	Cleanness.	Trueness to type.	Freedom from disease.	Apparent yield per acre.	Total.
					Bushels.	
W. Krella	Yanac ...	10	9	9	20	48
J. Dart	Woorak West	9	8	9	20	46
Roberts Bros. ...	Gerang	8	9	8	20	45
T. Cunningham ...	Baker ...	8	8	9	18	43
D. Roberts, Senior ...	Gerang ...	9	9	8	16	42
W. Avery	Antwerp ..	9	8	9	16	42
J. C. Dufty	Lorquon West	9	8	8	16	41
Chappina and Dillaca...	Nhill ...	9	8	8	16	41
C. Cramer	Yanac ...	7	8	7	16	38
T. Hornsby... ...	Tarranginnie...	8	8	8	14	38

SUMMARY OF THE WHOLE COMPETITION.

Viewing the whole competition from an outsider's stand-point, there are several matters which excite most favorable comment. First, the

JUDGING A FARMER'S HOMESTEAD AND GARDEN.

friendly manner in which the competition was carried out; second, the healthy spirit of emulation among the competitors; and third, the general excellence of the farms, both large and small, as well as the crops exhibited. I venture to express the opinion that the district generally has gone ahead considerably since 1903, which was the last occasion I had an opportunity to thoroughly inspect it. There is all-round evidence of improvement in farming methods, stock, and the general appearance of the farms. The recent good seasons are, no doubt, responsible for this to some extent, but I ascribe no small portion of the general improvement to the healthy stimulus of the Farm Competition itself.

In view of the amended regulations concerning the Government grant to Agricultural Societies, the farm competitions, as carried out by your Society, are likely to assume an important aspect. The conduct of experimental fields, the holding of farmers' classes, certificates of soundness for stock, and the carrying out of farm competitions are some of the matters which country societies must take up in the future in order to secure the Government grant. Your society has already fulfilled most of these regulations, and I have no doubt your methods in conducting these matters will form the basis of inquiry from other societies in the near future.

CONCLUSION.

This report would be inadequate without some reference to the excellent arrangements made for inspection of the farms and crops. During the eight days the judging was in progress no less than 240 miles were covered by vehicle, and something like 8,000 acres of crops inspected. I am personally indebted to yourself for the arrangements made for my comfort and also to the numerous gentlemen whose hospitality was so freely shown. In conclusion, I trust that your Society will soon take its rightful place as one of the leading educational media in agricultural affairs in the State.

THE PROCLAIMED PLANTS OF VICTORIA.

(*Continued from page 736, Vol. IV.*)

Alfred J. Ewart, D.Sc., Ph.D., F.L.S., Government Botanist; and J. R. Tovey, Herbarium Assistant.

Wild Mustard or Charlock.

Brassica sinapistrum, Boiss; Sinapsis arvensis, L. (Cruciferæ).

A coarse annual, 1 to 2 feet (30-60 cms.) high, with a few stiff spreading hairs. Leaves rough, with very short hairs, the lower ones usually with one large oval or oblong coarsely-toothed segment, and a few smaller ones along the leafstalk, the upper ones often undivided, oblong, or lanceolate. Flowers rather large and yellow. Pods more or less spreading, ½ to 1½ inches long, of which rather more than a third is occupied by a stout beak, often containing a seed in its base; the valves glabrous, or rough with stiff reflexed hairs, the lateral nerves prominent. A native probably of Southern Europe, but now one of the most abundant weeds of cultivation throughout the world.

It should be pulled up before the seeds mature, or hoed when young during dry weather. Spraying is less effective, but 5 lbs. of copper sulphate dissolved in 25 gallons of water, and sprayed over an acre in fine weather, while the charlock is young, has been found to reduce the evil. When the plant is growing among cereal crops, and ammonium sulphate is used as a manure, it has been recommended in Germany to apply 20 to 25 lbs. per acre as a spray in dry weather while the crop is young. The foliage of other crops than cereals is, however, apt to suffer injury by this treatment. Ground full of seeds should be fallowed, and the seedlings ploughed in as often as they appear in quantity. Proclaimed for the whole State.

PLATE 8

TATURA FARM COMPETITION, 1906.

W. Gamble.

Report to the Secretary, Tatura Agricultural Association.

Section A.—Small Farms.

In the small-farms section one farm only was entered—that of Mr. Gardom, situated about two miles from Byrneside Railway Station. On inquiring along the road the location of Mr. Gardom's farm, the ready answer came, "That place where you see the rows of pines and pepper trees." This was an apt description, and in the distance we could see trees extending all around the farm homestead. On arrival we were told that tree-planting formed one of the features of the farm work each year. The young trees are raised from seed and planted out the following season; pines, peppers, sugar gum and lemon-scented gum are intermixed, making a beautiful contrast, and providing shade from the burning rays of the sun, and shelter from the cold winds in winter. Mr. Gardom believes in beautifying his farm, and when told, on one occasion, that trees would not wipe the debt off the farm, his reply was—"The trees will be there when the debt is paid off." Mr. Gardom gained his farm experience by working for farmers, his first wages being only 5s. per week; he then took work at fencing, grubbing timber, harvesting, or anything whereby he could earn an honest penny, and it is creditable to him to have such a model and unique farm to enter in the competitions. The area of the farm is 240 acres, subdivided into eleven paddocks, ranging in size from 4 to 50 acres. A glance at the neatly-fenced and kept yards, good subdivision fences and gates, comfortable home surrounded by an orchard, vegetable and flower garden, shows everywhere the result of hard work and good taste. On the farm dairying and cultivation are the two chief sources from which an income is derived.

The rotation followed is, first year fallow, second wheat, third oats, and, by adopting this system along with thorough cultivation, there has never been a failure. This year there is a splendid 50-acre paddock of wheat with very few wild oats or dirt, and well up to the standard of any of the wheat crops entered for the competition. There are also 30 acres Algerian oats, with another 30 acres for hay, this paddock being one of the oldest cultivated paddocks in the district. It was broken up 32 years ago, and will yield a good return this year. There are two lucerne paddocks, 10 acres each, which are grazed in rotation; these are handy to the irrigation channel, the water being obtained at a cost of 2s. per acre for three waterings. With the application of water lucerne grows rapidly, and gives plenty of green succulent feed during the summer months. The one difficulty in irrigating this land is the number of depressions or "crab-holes" where the water collects, and is held as if in a basin by the retentive clay underneath. This causes the lucerne to wither and die, and consequently most of the paddocks show bare patches. It is quite evident that this class of land requires preparation for irrigation, so that the water may be distributed evenly over the surface. Mr. Lockwood, the President of the Agricultural Society, is anxious that experiments be made to determine the cost of levelling down the surface, so that the water will not

collect in pools, for with the high temperature in these northern areas the water becomes heated, and all plant life is destroyed.

With the aid of lucerne and silage, dairying in these districts is making good progress. In fact, I was surprised to see the quantity of milk coming into the local creamery, and of home-separated cream going away by rail. Fifteen cows are milked on this farm.

FARM BUILDINGS—SOME NOVEL IDEAS.

On the Northern plains the summers are hot, the flies troublesome; when winter comes round there are cold winds and muddy yards to contend with. To meet these inconveniences a large shed has been erected covering the whole of the yards (81 feet by 84 feet). It is built of forks and spars, covered with straw and neatly thatched, the thatch being covered with wire netting. The shed is closed in on two sides. The cows are brought in, and stand about in comfort, quietly waiting to be milked, none of them requiring to be bailed up. Everything about the shed is neat, clean, and tidy. A shed of this kind is a good example of a cheap, but effective, covering, cool in summer and warm and dry in winter, and one that any farmer may construct, and when done properly is not unsightly.

Another shed which attracted attention was a straw-covered one, used as a store for wheat, and capable of holding 1,500 bags of grain. Mr. Gardom claims that in this shed there are no mice, no weevils, and that no rain can get at the grain. On going through at the time of my visit some 900 bags of grain were stored, and not a broken bag was to be seen, a most unusual thing in a stack of wheat, for mice play havoc with grain in the Northern areas. Around the shed sheets of plain galvanized iron are placed lengthways; these sheets are 2 feet wide, and sunk into the ground about 3 inches, thus preventing mice getting in. Above this iron wire netting is stretched to allow free play of air through the building. The bags of grain are stacked five high on their flat, each row just touching the other. This plan leaves interstices through which the air plays freely, and a cat (one is kept continually in the shed) can get around every bag. The sparrows, another pest on wheat stacks, are kept down by abundantly feeding them on poisoned wheat during the months of July and August, when feed is scarce; consequently, none were to be seen. This storage shed is well worthy of a visit by any one interested in the matter.

The losses of stock in the drought of 1902-3 proved a lesson to many farmers to save their straw, and when travelling through the country it is noticeable that on nearly every farm large straw stacks are fenced in for future use. This farm is exceptionally well provided for, having six large straw stacks, some of which are of Algerian oats. As this is nearly equal to hay for feeding purposes, a stand-by of this kind is invaluable where dairying is carried on, and the possibility of droughts has to be faced. All the crops this year will be cut with the reaper and binder, the object being to keep up a supply of fresh straw. The older stacks are fed out to the cattle in winter: much of it is eaten, the balance being tramped down, making manure, which is carried out to the lucerne paddocks and spread over the low-lying patches. This assists the lucerne, and prevents the soil becoming hardened and caked. Where irrigation is practised, the organic portion of the soil is washed out or used up by the plant to such an extent that the soil soon tends to become consolidated, and when dry it appears more like half-burnt bricks. To remedy this, ploughing in green manure,

such as peas, rape, cow-peas, lentils, &c., will have to be adopted, or else abundance of farmyard manure provided, or the land will become partially sterile for the want of humus.

On Mr. Gardom's farm the by-products are used up for fattening pigs, raising turkeys and fowls. The returns shown me from these were by no means small, and it is strict attention to these minor details in connexion with farming that very often turns the financial balance on the right side. Other instances of careful farm practice were to be seen in the cut thistles, not one being allowed to escape the hoe. The fences were all in good order, the old fences being gradually replaced by new ones, consisting of two barbs and four plain wires—top heavy barb, next plain wire, then a light barb drawn through 1-inch auger-holes, and below this three plain wires. The effect of the middle barb is that it prevents stock rubbing and loosening the wires. Each year old stumps are burnt out by means of cocky chaff, and gradually the whole farm is becoming cleared of valueless and unsightly stumps.

When visiting a successful farmer's holding it is noticeable that a definite system is carried on in all things pertaining to the farm, and success is attributable, to a great extent, to systematic work in all things. There are places for everything, and each week or month brings round work which is done thoroughly and at the right moment. And in this respect Mr. Gardom is well ahead; his farm is not only well worked, but well managed.

SECTION B.—WHEAT COMPETITION.

It is desirable to encourage farmers in every possible way to improve their methods of agriculture, and any advance with regard to wheat-growing is of special importance. The production of wheat in Victoria is one of our staple industries, and too much care and thought cannot be bestowed on any system that will tend to increase the yield per acre, especially if this can be done at the same, or even at a reduced, cost. There is no more effectual way of doing this than by offering inducements to the farmers or producers to improve their cultivation methods, clean their land, and raise pure seed. Competition in grain-growing throughout the world is so keen that it is essential that we should use our utmost endeavours to increase production and minimize the cost.

A moment's reflection upon the changed conditions under which farming is now conducted, as compared with those which prevailed a few years ago, brings home to us the fact that continual improvement in our methods is necessary if we are to keep abreast of the times and compete with other countries in producing cereals. The world's markets are now easily reached by all wheat-producing countries; extensive railways are opening up new countries, so that to-day we are in competition with those who will spare no efforts in encouraging production, and will sell at the smallest margin of profit. It is to the credit of Victorian farmers that they have made many improvements in their methods of cultivation in order to comply with the fresh demands and new conditions forced upon them, and a crop may now be produced and harvested at a much less cost than a few years ago.

But we must go on improving, and where farm and wheat competitions are being held under proper conditions a healthy impetus is given to improvements. I should like to see more Agricultural Societies take this matter up, and offer encouragement to farmers to produce not only better crops, but to raise pure and typical seed of whatever crop they may grow.

There are few farmers who have not at one time or other had to complain of the bad quality of the seed obtainable, and in some instances the partial failure of the crop can be traced to seed which is deteriorating. Speaking generally, the failure of a crop can be traced to certain conditions viz., bad cultivation, unsuitable preparation of the seed bed, time of sowing, adverse climatic conditions, and faulty seed. In many cases where the seed is at fault experience has shown that the trouble and expense entailed could have been avoided if the farmer had made a careful selection and examination of his seed. It should be the aim of every grower to steadily improve his seed, as the selection of a good sample, together with thorough cultivation, will cause the ensuing crop to grow more regularly, withstand weather conditions better, ripen more evenly, and yield a greater return of produce of superior quality. In several cases when going through the wheat crops, I noticed many of the ears were small, stunted, and puny—a sure sign that the plant is on the down-grade or "running out." This can be remedied only by selection, and I would advise wheat-growers to pay strict attention to this, and not re-sow any grain from such a crop. The seed grader which has come into more general use will do a great deal towards keeping up the standard of our wheat, but there is plenty of room for seed raisers to hand select small quantities from a growing crop, taking care to secure ears that are thoroughly typical of the variety (not necessarily large ones), but those that show symmetry, evenness, and compactness in their formation, and contain a full plump grain. Other attributes of the plant must be taken into consideration when selecting, such as strong, upright straw and growth, tillering propensities and liability to "shake." Strength of straw is one of the most important features, as in most of our wheat-growing districts high winds prevail, and modern methods of harvesting make it desirable that the straw be upright. Where large areas are under cultivation portions have to remain unharvested until late in the season, and with strong straw varieties the risks of "lodging" are lessened. To become a specialist in growing seed wheat presents no difficulties that the ordinary farmer cannot surmount; but I would point out that any one undertaking this class of work must be enthusiastic, and must personally supervise all operations most carefully, so that everything produced will be a pure variety and the best of its kind. I would like to see some of our prominent young farmers take this matter up, and devote some of their time to selecting and raising pure seed. Such labour would be well repaid by the demand that would be created for seed of established merit.

There is another point in raising seed wheat that should be of interest to farmers, but which, so far, has been left to scientific experimenters, such as Mr. Pye, of Dookie College. I refer to what is known as the "strength" of wheat, which means the presence of gluten in sufficient quantities and of the right kind; experiments have proved that it is possible to increase this constituent, and, therefore, raise the value of any variety of wheat as a food-stuff. Another point that should be kept in view in these competitions is the encouragement of farmers to put up a good marketable product; the tendency is to allow everything to run into the bags for sale, and experience of sampling at the port of shipment leads me to say that a great deal of what is sent forward could be greatly improved before leaving the farm by careful grading, and if this were done farmers would be the gainers through the enhanced price of the product.

The wheat crops throughout the Tatura district are, this season, extremely dirty, and in fact the whole of the Goulburn Valley crops are

affected in this way, owing to the wet season germinating wild oats, which have lain in the ground awaiting favorable conditions. Fallow and ploughed land are alike, and even some of the virgin land shows a sprinkling of wild oats, thistles, &c. Generally, the crops are heavy, with rust showing on the blade, but little or none on the stem, not enough being present to affect the development of the grain, except in isolated cases. The yields will be above the average.

The following table shows the scale of points, the prize-takers, and the results in the order in which they are placed:—

—	Cleanness of crop.	Trueness to type and character.	Evenness of crop.	Freedom from disease.	Apparent yield.	Totals.
Maximum points	20	20	15	15	30	100
1. A. Martin, Ardmona ...	12	14	12	11	25	74
2. A. Manning, Harston ..	17	12	8	13	20	70
3. H. Goodson, Harston ...	9	10	12	12	25	68
4. A. Martin, Ardmona ...	7	15	13	8	24	67
5. Geo. Crawford, Harston ...	12	10	12	12	19	65

The scale of points is the same as that used last year, and again I have paid particular attention to the second item, "Trueness of type and character," for in this direction there is room for great improvement. Mr. Martin, of Ardmona, who secured the first prize, had a very fine paddock of the Purple Straw variety on red loamy chocolate land, which was cropped with wheat last year. Previous to that it had been sown down in lucerne, and grazed for about ten years. This season it was ploughed about 4½ inches deep, harrowed twice, rolled, and the seed drilled at the rate of 45 lbs. per acre, together with 50 lbs. superphosphate, in the third week of May. The crop was not eaten off during winter owing to the exceptionally wet state of the land. Like all the crops, wild oats showed up here and there in white dried patches, but the crop was well headed and fairly true to type, and I estimate the yield at fully six bags per acre. Mr. Martin obtained his seed last year from Quat Quatta, N.S.W. Some very fine and typical ears of the Purple Straw variety were to be seen in the crop, from which it would repay any one to make a selection and re-sow for a future supply of seed. In wheat-growing Mr. Martin is an enthusiast, and I hope he will use his utmost endeavours to improve the varieties he is growing.

The second prize went to Mr. Manning, Harston, who showed portion of a 70-acre paddock, virgin land of a light loamy character, with a little ironstone gravel, fallowed and worked during early summer. Again, the variety was Purple Straw, sown with the drill at the rate of 40 lbs. seed with 30 lbs. superphosphate. This crop was the only one I saw that was free from wild oats, and gained highest points in that item, but lost heavily in evenness, as it was inclined to be patchy. The type was only medium, some of the ears were narrow, and showed only two rows of grain, and stray ears of other varieties appeared up here and there. Competitors

must look to their seed, and sow none but a pure seed. I understand the difficulty there is in securing this, but why should not each man raise it on his own farm? Most farms have a variety of soils, such as a light sandy and heavy chocolate or clay, and by hand selection of seed, then change of soil, together with thorough cultivation, any variety of grain may be improved. I am not advocating this system as a theoretical one, but as one that is practical, and which will, in the near future, become the practice with all up-to-date farmers. Mr. Manning secured his seed from Stanhope, Victoria, where large areas of new country have been recently broken up for cultivation. The apparent yield of this crop is about five bags per acre.

The third prize was secured by Mr. Goodson, Harston, who exhibited a portion of 160 acres of very heavy crop. The variety was the same as the preceding, and grown on a free loamy chocolate soil. This crop is the third grown on what was previously new land. Last season Mr. Goodson grew four varieties and found this one—Improved Purple Straw—gave the best yield. He saved the seed and re-sowed it, but some of it has become mixed, as I noticed a few heads of Dart's Imperial and several other varieties in the crop. You will notice this crop lost points heavily in cleanness, as it contained a great deal of foreign matter. Portions of the crop were lodged badly, but with all these disadvantages I considered it will give the highest yield of any crop visited by me, but the points lost in the other items pulled it down to third place only.

Mr. Martin's crop of Steinwedel gained higher points in trueness to type and character; the ears were especially even and typical, with none of the small, weedy heads so often seen in our crops at the present time. Unfortunately, take-all, white heads, and rubbish debarred this crop from being placed.

Mr. Crawford showed a paddock containing 32 acres of Red Purple Straw on unfallowed land and unmanured. The points for the crop run out very consistently, and I have no doubt, had it received about 30 or 40 lbs. superphosphate, it would have been placed.

In every case the seed wheat was pickled for smut and bunt, ½ lb. of bluestone per bag being used; some adopt the dipping method, others sprinkling and turning over on a floor.

None of the crops were eaten off this season. I am of the opinion that feeding-off has a very beneficial effect on wheat crops at all times, and it is a pity we have not any data extending over a period of years showing the effects of eating down in the winter. There is a considerable undergrowth in all the crops, principally clover of two varieties—woolly clover (*Trifolium tomentosum*) and native clover (*Trifolium glomeratum*)—and it is surprising to see how rapidly these plants have spread over the Goulburn Valley during recent years. Both provide excellent feed during winter and spring, but dry up early in the summer, leaving the ground bare. Horses and sheep lick up the seeds and pods from the ground, but cattle do not adapt themselves to this mode of feeding so easily, and, consequently, these clovers are looked upon with a certain amount of disfavour by dairy farmers. These small clovers have a very beneficial effect on the soil on account of their power of absorbing nitrogen from the air and converting it into compounds that supply nitrogenous food to the plant.

I have to thank the President (Mr. Lockwood), Secretary (Mr. Clarke), and members of the committee for their kindness and assistance in getting around the district to the various farms. Mr. Clarke carried out all matters of detail expeditiously, and no time was lost in getting to work.

AGRICULTURAL EDUCATION.

Report on Classes held during 1906.

H. V. Hawkins, Organizing Officer.

At no time in the world's history has there been greater need than now for the farmer to keep himself in touch with its progress in agricultural matters, for we live in a time of improved methods, and in farming, as in all branches of production, it is absolutely necessary that we should be "up-to-date" in order to obtain the best results. To stand still now-a-days means retrogression.

The series of Classes for Farmers organized by the Department of Agriculture during the past year have been so successful in point of attendance and interest of the students, as well as in the excellence of the instruction given by the various lecturers, that it is evident that the farmers are fully alive to the necessity of equipping themselves with the latest practical knowledge and ideas; in fact, so great has been the demand for instruction throughout the State that the Department has had no little difficulty in coping with it.

These classes were started in 1902 with three centres; in 1904 the number of centres increased to 7; in 1905 they rose to 11; while in the year under review there were 17, exclusive of a special course of lectures given at the Bairnsdale School of Mines. The number of students enrolled at the whole of the centres amounted to 1,321, an increase of 247 on the preceding year.

There is one point to be borne in mind when considering the number of students enrolled, viz.:—That, as the number of centres is increased it is only to be expected that the average number at each centre will in some degree be affected, because the more centres there are, the closer they will be together. On the other hand, it will be an advantage to the farmers to have more centres, as they will then have less distances to travel. In this connexion it is interesting to note, as evidence of the interest displayed, that at several centres some of the students came from distances as far as 30, and in a few cases 50 miles.

Taking these figures into consideration and the nature of the instruction given, the importance of the classes is at once apparent. Not only do the students go back to their farms with new ideas and methods for practical application, but they must necessarily, to some extent, spread the knowledge acquired to others, and so extend the good work carried out by the Department. Another feature of the work worth commenting on is the fact that the classes bring the farmers into closer relationship and afford them an opportunity for discussing ideas and methods, old and new, and thus mutually helping one another; and, further, create a spirit of inquiry and emulation, as well as a feeling of friendliness, and do something at all events to break the monotony of country life.

During the past year it has been found advisable in one or two centres to raise the standard of instruction given. Many of the students who attended previous courses have again presented themselves, and, naturally, look for advanced knowledge. This, of course, is a pleasing feature, but it has one drawback in that it deprives the "raw recruits" of the

important elementary instruction which is given in the first place. This point will require careful consideration in the future working of these classes.

CLASSES HELD DURING 1906.

Classes were established at Nhill, Warracknabeal, Colac, Sale, Drouin, Leongatha, Castlemaine, Bendigo, Wedderburn, Numurkah, St. Arnaud, Donald, Wodonga, Shepparton, Geelong, Yarrawonga, and Echuca, the term of each being two weeks.

The lecturers were as follow:—

Dr Cherry—Introductory Lecture.
F. E. Lee—Manures, Cultivation and Experimental Work.
A. S. Kenyon—Agricultural Surveying and Water Conservation.
R. T. Archer—Dairying and Dairy Management.
H. V. Hawkins—Poultry Breeding and Management.
Dr. Brown—Sheep Ailments.
J. Cronin—Fungus Diseases.
H. S. Rudduck—Veterinary Science.
C. D. Strong—Veterinary Science.
W. Kenneally—Practical Farriery.
W. Haile—Wool Sorting and Classing.
E. E. Lazarus—Agricultural Surveying.

The following table gives an analysis of the attendance and results of examination for each centre, the large number of visitors (numbering 4,130 attendances in all) who attended more or less regularly not being included in the return:—

Centre.	Number of Students enrolled.	Average Daily attendance.	Number of Examination Papers.	Percentage of Marks gained by each Centre.
Nhill	49	38	103	68.24
Warracknabeal	54	26	37	27·68
Colac	90	28	45	32·39
Sale	52	35	70	48·83
Drouin	52	35	73	46·54
Leongatha	44	19	Nil	
Castlemaine	53	21	23	19·10
Bendigo	70	24	73	48·54
Wedderburn	63	31	28	13·48
Numurkah	82	23	10	6·55
St. Arnaud	170	124	81	41·11
Donald	64	27	22	17·25
Wodonga	140	121	45	25·54
Shepparton	50	19	50	25·24
Geelong	76	42	102	59·01
Yarrawonga	93	65	48	30·87
Echuca	119	71	45	31·44

EXAMINATION RESULTS.

Examination papers were set by Messrs. Lee, Hawkins, Archer, Kenyon, Rudduck, Strong, Haile, and Cronin, and Dr. Brown. The short time allowed for each examination did not permit of more than three comprehensive questions (except in wool classing) being set by each lecturer.

Regarded as a test of how the instruction had been received, the results on the whole are very satisfactory, and are an indication that the majority of the students possess a good general knowledge of the leading features of each subject.

The following are the detailed results for each centre. It is to be noted that the percentage of maximum marks is based (as in previous years) on the maximum for the six subjects combined, which, of course, adversely affects the averages of those students who did not compete in all subjects:—

NHILL.

Student's Name.	Lee.	Hawkins.	Rudduck.	Archer.	Kenyon.	Halle.	Total.	Percentage of Maximum.
Pilgrim, P.	92	100	86	95	85	99	557	92.8
Dahlenberg, W. E ..	90	95	73	96	97	100	541	90.1
Oldfield, W. W.	60	94	65	90	44	95	448	74.6
Langtry, L.	45	88	77	96	39	80	425	70.8
Baird, S.	56	90	70	90	95	..	401	66.8
Meagher, J.	62	92	58	90	..	98	400	66.6
Dahlenberg, P.	53	90	66	90	22	70	391	65.1
Welsch, W.	72	95	50	90	10	60	377	62.8
Bond, A.	25	90	76	90	..	90	371	61.8
Peaps, G.	88	90	28	90	2	65	363	60.5
Rintoule, D.	60	60	55	85	37	65	362	60.3
Ward, C.	37	85	72	60	12	68	334	55.6
Gniel, J. W.	55	75	62	80	2	60	334	55.6
Duthie, G.	42	75	57	60	14	64	312	52
Batson, G.	20	60	60	50	14	65	269	44.8
Barber, Miss M.	..	90	..	85	..	..	175	29.1
Wohlers, Miss E.	..	75	..	90	..	..	165	27.5
Luhrs, P.	47	88	..	..	..	..	135	22.5
Fitzell, L.	45	80	..	..	..	..	125	20.8
Macpherson, A.	25	92	..	..	..	..	117	19.5
Dahlenberg, V.	5	90	..	..	..	..	95	15.8
East, W.	..	..	..	..	..	95	95	15.8
Dahlenberg, Miss M. ..	..	92	..	..	..	..	92	15.3
Steer, H.	..	50	32	..	..	..	82	13.6

WARRACKNABEAL.

Student's Name.	Lee.	Hawkins.	Rudduck.	Archer.	Kenyon.	Halle.	Total.	Percentage of Maximum.
Bennett, Jas.	95	88	86	95	99	..	463	77.1
Bartram, R.	95	90	80	95	100	..	460	76.6
Bryant, T. G.	91	100	70	96	85	..	442	73.6
Reed, A. W.	65	70	73	50	85	92	435	72.4
Reed, E. H.	65	80	55	75	80	45	400	66.6
Clarke, W. J.	..	60	25	85	..	90	260	43.3
McDonald, A.	75	65	..	..	67	50	257	42.8
Nottle, R.	60	..	..	..	50	..	110	18.3

NOTE.—Two papers unsigned have been omitted.

COLAC.

Student's Name.	Lee.	Hawkins.	Ruddock.	Archer.	Kenyon.	Halle.	Total.	Percentage of Maximum.
Nicholas, J. W.	95	62	76	91	69	95	488	81.3
Stephens, A.	85	60	73	97	60	80	455	75.8
McRae, A.	65	78	78	90	70	60	441	73.5
Selwood, W . ..	65	98	72	60	55	80	430	71.6
Fenton, C. H. . ..	85	80	58	80	..	50	353	58.8
Fisher, A. W.	..	75	55	87	37	65	319	53.1
Sherren, W. E.	..	70	50	..	..	65	185	30.8
Murray, R. N. . ..	30	..	..	..	70	..	100	16.6
Murray, Miss J.	..	100	..	..	..	..	100	16.6
Hayes, Mrs.	..	98	..	..	..	..	98	16.3
Sydenham, Miss	..	92	..	..	..	..	92	15.3
Jenkins, Miss C.	..	88	..	..	..	..	88	14.6
Jenkins, Miss A.	..	86	..	..	..	..	86	14.3
James, G.	73	..	..	..	..	..	73	12.1

SALE.

Student's Name.	Lee.	Hawkins.	Ruddock.	Archer.	Kenyon.	Halle.	Total.	Percentage of Maximum.
Coto, T. W.	94	95	80	98	80	85	532	88.6
McLean, E. F.	90	80	82	97	95	78	522	87
Napper, T.	80	85	73	90	85	87	500	83.3
Harrison, R.	70	65	78	95	50	90	448	74.6
Harrison, C. K.	80	75	80	93	25	85	438	73
Borthwick, J. M.	70	85	63	94	85	25	422	70.3
Morrison, A. .. .	37	70	54	85	70	75	391	65.1
Gooch, J.	41	70	55	80	35	85	366	61
O'Sullivan, E.	..	80	68	90	35	80	353	58.8
Hawkins, A.	50	65	50	90	..	78	333	55.5
Robinson, T. A.	50	70	58	85	..	70	333	55.5
Heneberry, R.	45	25	50	85	..	20	225	37.5
Andrews, C. H.	..	75	..	..	..	..	75	12.5
Pruden, T. G.	..	..	..	..	45	..	45	7.5

CASTLEMAINE.

Student's Name.	Hawkins.	Ruddock.	Archer.	Kenyon.	Halle.	Cronin.	Total.	Percentage of Maximum.
Hill, W. C.	100	76	98	100	95	90	559	93.1
Templeton, T.	90	60	87	97	60	95	489	81.5
Brotherton, Miss W. ..	100	86	100	..	65	100	451	75.1
Blakely, W. R.	85	50	90	70	65	90	450	75

DROUIN.

Student's Name.	Hawkins.	Rudduck.	Archer.	Halle.	Brown.	Total.	Percentage of Maximum.
Fuhrmann, F.	94	60	90	60	65	369	61.5
Morton, W. H.	75	80	95	90	28	368	61.3
Young, P. W.	90	78	90	70	25	353	58.8
Coster, C.	70	68	90	85	35	348	58
Harkness, W. S.	65	72	85	91	30	343	57.1
McNeilly, W.	100	53	90	70	28	341	56.8
Harkness, W. A.	40	78	85	90	25	318	53
Russell, E.	75	45	95	70	30	315	52.5
Maynard, C. H.	75	60	85	60	25	305	50.8
Young, G.	65	55	87	65	25	297	49.5
Kroschel, F.	70	66	65	35	45	281	46.8
Rogers, L. E.	75	48	87	35	25	270	45
Kelleher, E. J.	45	62	80	53	28	268	44.6
Grant, D.	100	82	..	..	..	182	30.3
Higgs, G.	80	68	..	..	..	148	24.6
Higgs, H.	60	70	..	..	..	130	21.6
Stephens, J.	65	50	..	..	..	115	19.1

WEDDERBURN.

Student's Name.	Hawkins.	Rudduck.	Archer.	Brown.	Halle.	Total.	Percentage of Maximum.
Gray, A.	70	100	90	50	80	390	65
Lang, G. S.	75	80	..	15	..	170	28.3
Nixon, A.	65	78	..	25	..	168	28
Edgar, T.	55	76	..	15	..	146	24.3
Gould, Wm.	45	50	..	40	..	135	22.5
Roberts, E.	45	54	..	20	..	119	19.8
Lang, R. J.	45	52	..	..	..	105	17.5
Patterson, J.	45	44	..	15	..	104	17.3
White, J. F.	..	30	..	10	..	40	6.6

NOTE.—Owing to heavy floods in the district many of the students found it impossible to attend throughout.

NUMURKAH.

Student's Name.	*Hawkins.*	Rudduck.	Archer.	Brown.	Halle.	Total.	Percentage of Maximum.
Mortimer, J.	55	63	85	50	60	313	52.1
Bedwell, F. W.	70	72	..	..	..	142	23.6
Chapman, R. C.	60	75	..	..	..	135	22.5
Williams, A.	80	..	..	..	..	80	13.3

BENDIGO.

Student's Name.	Hawkins.	Rudduck.	Archer.	Kenyon.	Brown.	Halle.	Total.	Percentage of Maximum.
McRobert, W. G.	90	90	95	80	60	98	513	85.5
Richardson, H. V.	94	78	90	75	60	100	497	82.8
Carter, F.	92	80	60	80	60	92	464	77.3
Warne, F. N.	75	84	70	96	35	80	440	73.3
Warne, S. E.	98	75	80	35	35	80	403	67.1
Grelis, T. M.	100	65	60	37	40	90	392	65.3
Hayhurst, R.	75	50	70	55	28	75	353	58.8
Clarkson, Jas.	55	50	80	30	40	65	325	54.1
Taylor, A. W.	88	70	80	87	..	..	325	54.1
Gardner, A.	65	40	50	60	15	60	290	48.3
Yeaman, C. A.	50	50	50	..	..	70	220	36.6
Gittins, H.	65	86	..	..	..	..	151	25.1
Bennett, Harold	70	76	..	..	..	..	146	24.3
Mueller, P. A.	95	43	..	..	..	..	138	23
Bennett, Herbert	65	63	..	..	..	..	128	21.3
Anderson, R.	45	45	..	..	..	..	90	15
Read, H. J.	..	80	..	..	..	..	80	13.3

ST. ARNAUD.

Student's Name.	Hawkins.	Rudduck.	Archer.	Kenyon.	Brown.	Halle.	Total.	Percentage of Maximum.
Duggan, B.	82	52	95	75	60	65	429	71.5
Duggan, P. J.	72	55	97	50	75	74	423	70.5
Hawksley, T. E.	65	80	90	50	45	80	410	68.3
Hudson, G.	65	58	96	60	50	70	399	66.5
King, A. C.	75	74	95	30	70	50	394	65.6
Eckersley, W. H.	25	70	98	35	82	60	370	61.6
Gleeson, E.	30	32	90	45	60	85	342	57
Hodgson, J.	50	50	90	60	50	40	340	56.6
Boyle, D.	25	30	90	60	32	55	292	48.3
Wright, B. A.	35	25	88	40	20	30	238	39.6
Lang, G. S.	80	86	..	..	..	..	166	27.6
Armstrong, H. O.	65	84	..	..	..	..	149	24.8
Cunningham, J. H.	60	64	..	..	..	..	124	20.6
Giles, A. J.	50	58	..	..	..	..	108	18
Dyke, J.	35	60	..	..	..	..	95	15.8
McDonald, J.	..	90	..	..	..	..	90	15
Mawallack, T.	25	55	..	..	..	..	80	13.3
Mathieson, D.	..	78	..	..	..	..	78	13
Chisholm, J. J.	15	60	..	..	..	..	75	12.5
Reid, G.	14	54	..	..	..	..	68	11.3
Langdon, W.	..	60	..	..	..	..	60	10
Gleeson, J.	..	..	..	..	..	..	40	6.6
Reid, P.	..	30	..	..	..	..	30	5

DONALD.

Student's Name.	Hawkins.	Rudduck.	Archer.	Kenyon.	Halle.	Total.	Percentage of Maximum.
Pearse, W. N.	70	86	96	80	96	428	71.3
Hepworth, W.	75	88	99	69	92	423	70.5
Adams, A. W.	70	70	90	75	94	399	66.5
Pearse, E. E.	68	65	100	65	95	393	65.5
Tyson, A.	..	56	..	62	..	118	19.6

NOTE.—Owing to heavy floods in the district many of the students found it impossible to attend throughout.

WODONGA.

Student's Name.	Archer.	Hawkins.	Kenyon.	Brown.	Strong.	Halle.	Total.	Percentage of Maximum.
McGeoch, J. H.	100	100	89	70	85	100	544	90.6
Keam, —	96	52	90	62	70	65	435	72.5
Tobin, W.	97	55	80	25	65	85	407	67.8
Kurrle, O.	93	50	70	25	25	45	308	51.3
Mason, C.	65	35	67	15	50	40	272	45.3
Muller, W.	60	35	17	25	20	50	207	34.5
Patterson, A.	..	..	87	50	45	..	182	30.3
Nunan, A. P.	55	50	..	..	..	40	145	24.1
Murphy, J.	..	..	22	45	40	..	107	17.8

GEELONG.

Student's Name.	Cronin.	Hawkins.	Strong.	Archer.	Kenyon.	Halle.	Total.	Percentage of Maximum.
Grace, F. C.	100	100	80	96	50	90	516	86
Hennessy, J. M.	75	70	58	90	80	92	465	77.5
Pawsey, C.	90	80	72	85	65	65	457	76.1
Horwood, T.	85	75	70	90	20	85	425	70.8
Jackson, J.	70	70	40	80	80	80	420	70
O'Brien, J.	85	92	35	85	23	90	410	68.3
Robb, T.	70	70	50	93	..	90	373	62.1
Batson, E. P.	55	80	20	85	20	99	359	59.8
Wilson, H. J.	..	72	72	98	..	98	340	56.6
Tozer, H.	75	80	35	85	20	40	335	55.8
O'Brien, B.	50	60	15	80	60	45	310	51.6
Batson, S. E.	50	45	15	70	20	95	295	49.1
Batson, H. A.	20	72	15	70	20	96	293	48.8
Jackson, P.	35	45	15	85	20	92	292	48.6
O'Brien, M.	20	65	10	93	20	60	268	44.6
Weitnauer, E.	..	..	..	85	..	85	170	28.3
Capstick, H.	..	..	5	70	..	40	115	19.1
Craike, W. D.	60	..	..	..	40	..	100	16.6
Anderson, G. M.	60	..	..	..	20	..	80	13.3

SHEPPARTON.

Student's Name.	Hawkins.	Archer.	Kenyon.	Strong.	Halle.	Brown.	Total.	Percentage of Maximum.
Prideaux, H.	85	90	89	20	80	50	414	69
Horan, G.	80	85	57	..	85	40	347	57.8
Coldwell, E.	68	87	73	30	40	20	318	53
Vincent, A	60	80	..	70	45	20	275	45.8
Gibbs, J.	50	80	42	30	50	20	272	45.3
Gibb, R	60	80	36	15	35	15	241	40.1
Erwin, A.	45	80	32	5	30	30	222	37
Cahill, A. J. . ..	72	..	84	..	40	..	196	32.6
Allan, J. J. . ..	50	80	21	10	20	..	181	30.1
Jones, A. J.	..	85	..	30	..	..	111	18.5

NOTE.—Owing to heavy floods in the district many of the students found it impossible to attend throughout. Two papers unsigned have been omitted.

YARRAWONGA.

Student's Name.	Archer.	Hawkins.	Kenyon.	Brown.	Halle.	Strong.	Total.	Percentage of Maximum.
Gemmell, A.	92	90	70	50	96	85	483	80.5
Wallace, G. A.	90	84	90	32	75	85	456	76
Chappell, A. B.	87	88	70	15	80	70	410	68.3
Chappell, A. R. .. .	85	86	70	15	75	55	386	64.3
Gemmell, E.	80	65	60	20	90	40	355	59.1
Bruce, R.	85	50	..	25	60	40	260	43.3
Lane, A. G.	90	62	..	..	70	..	222	37
Hicks, A.	60	58	...	..	95	..	213	35.5
Daymond, H.	..	..	90	35	..	60	185	30.8
McKenzie, J.	60	60	..	..	60	..	180	30

ECHUCA.

Student's Name.	Archer.	Hawkins.	Kenyon.	Brown.	Halle.	Strong.	Total.	Percentage of Maximum.
Johnson, E. R.	98	100	100	90	100	95	583	97.1
O'Grady, E.	93	90	95	35	80	80	473	78.8
Dawes, H. W.	80	85	67	36	100	80	448	74.6
Crawford, J. W.	90	75	37	35	95	85	417	69.5
Pickens, F. W. G. ..	70	60	35	15	70	50	300	50
Paynter, S. E.	90	100	65	..	..	..	255	42.5
Dobson, G. W.	93	80	62	..	..	...	235	39.1
George, C.	90	..	17	20	80	50	217	36.1
Russell, H., jun.	87	75	50	..	..	..	212	35.3
Allibrand, T. G.	..	70	..	..	..	...	70	11.6

A.N.A. GOLD MEDALIST.

The Australian Natives Association has again donated a gold medal for the student gaining the best aggregate of marks in all subjects, and the honour of winning this belongs to Echuca. Mr. E. R. Johnson, B.A., secured an aggregate of 583 marks out of a possible 600, or 53 marks ahead of last year's winner. A scrutiny of the points awarded at each centre will show that there were many excellent papers, and that the winner had no easy task to carry off the prize from 197 competitors, exclusive of a few informal papers. Several local prizes were also offered by the various associations throughout the State; the successful students in these cases should make application to the Association under whose auspices the class was held.

REPORTS BY THE LECTURERS.

Mr. F. E. Lee.—"On the whole, I am well satisfied with the papers. They indicate that the students had an intelligent grasp of the subject matter of my lectures, with perhaps the exception of the valuation of artificial manures. As in the previous examinations, the answers to this question reveal the need for a more complete understanding on the part of the farmers in the purchase of fertilizers."

Mr. A. S. Kenyon, C.E.—"I was not able to attend all the centres, but there was, judging from my personal experience, and from the answers to questions set by my substitute, on the whole a notable advance upon the results of last year. This was particularly marked in connexion with questions involving calculations and original thought. Still, the evidence is strong that the lectures require to be extended if anything like a lasting grip of the subjects is expected. Indeed, without some arrangement for continuation of study and practice, even extended lectures will not suffice. Students should make up their minds to either study individually, or preferably, collectively, by forming associations."

Dr. A. A. Brown.—"It is very pleasant to find that great attention must have been paid to the lectures, since the papers were very well answered. It must not be forgotten that the students came to the examinations and answered questions without any reading up on the lectures delivered. This clearly shows that they take an interest in the work, and that they are anxious for instruction."

Mr. H. V. Hawkins.—"The subject of poultry raising has this year been remarkably well received throughout the whole of the 17 centres, and the interest taken by the students in the ocular demonstrations has been very encouraging. At no centre were the ladies absent, but rather an increased attendance has been manifest, more particularly at the evening lectures. It will be seen by the report in tabulated form that the largest number of papers in any one subject is that of poultry. It may be of interest to note that one of the most complete examination papers I have had the pleasure to read was that of a lady student at Castlemaine, Miss Brotherton. Taking the papers as a whole, special mention is due to all of those coming from Nhill, and it is conclusive that the three years' work of the classes in that town has done much good, and the students right through the centres have a good general knowledge of what to do and how to do it."

Mr. R. T. Archer.—"I am very pleased to find the replies to the examination questions quite equal to the standard of former years; some

of the best papers are from places least expected, and show that a keen interest was taken in the lectures. One of the most pleasing features in connexion with the classes is the increasing interest everywhere evinced in dairying matters, and the extent to which the industry is spreading and the profitable returns being obtained from it in all parts of the country. The classes are certainly increasing in popularity, and this is always more evident when it is seen what the nature of the work in connexion with the classes is."

Mr. W. Hoile.—"The attendances at my lectures and demonstrations this season have been exceptionally good, and great interest has been manifested in the work. In every centre the students desired more practical work; this I cheerfully gave, giving additional lessons in the morning, which, judging by the large numbers attending, and the practical work done by the students, were highly appreciated. The examination papers

VETERINARY SCIENCE DEMONSTRATION, ST. ARNAUD CLASS.

on the whole are very good—some exceptionally so—which speaks for itself that the instruction given has been retained. I have had several applications for samples of wool as a guide for classing farmers' clips; in all cases the required wool has been forwarded."

Mr. H. S. Rudduck, G.M.V.C.—"A great interest has always been manifested in this subject, and some of the papers are very good; two are worthy of special mention, viz., the one sent in by Miss W. Brotherton at Castlemaine; and at Wedderburn the paper sent in by Mr. A. Gray. The latter is, so far, the best I have received, the full complement of marks indicating its completeness; at the same time, it must be remembered that Mr. Gray is a Veterinary Surgeon, and consequently outclasses the ordinary student. Although I am very pleased with the popularity of this subject, and admit that many of the papers were most satisfactory, I do not favour these examinations. In several centres the students were examined within half-an-hour after the deliverance of a lecture, so that the one with the most retentive memory always sent in the best paper and scored against men who could lose them in the practical application of the subject. Then again, there is a tendency to make a young fellow who has sent in a good

paper, and marked accordingly, feel that he knows a good deal about veterinary work—his paper shows it—whereas it must be remembered that in these lectures we only have time sufficient just to touch on the fringe of a few of the common ailments."

Mr. C. D. Strong, G.M.V.C.—"The results on the whole are satisfactory, some of the candidates gaining a high percentage of marks. The Veterinary Science classes are apparently of great interest to the farmers and stock owners, as is evidenced by the large and enthusiastic attendances at lectures and demonstrations. The lantern lectures have drawn specially large classes, and Mr. Kenneally's shoeing demonstrations have been a valuable adjunct to my lectures and greatly appreciated by all students."

Mr. J. Cronin.—"Questions were submitted at two centres only, viz., Geelong and Castlemaine. At Castlemaine two questions only were asked, on account of brevity of lectures, while at Geelong (where I met the class on four separate occasions), four questions were submitted. The papers received from Castlemaine (four) were all correct, one being of special excellence covering a much wider range than the question demanded. Seventeen papers were received from Geelong, of which one was specially excellent, three poor, and the rest fair to good. Generally the students displayed a fair knowledge of the most important points in relation to the questions submitted."

The pleasant relations existing at all the centres between the students and the lecturers have contributed in no small measure to the success of the work; while the many courtesies extended to the staff by the officers of the local Societies and of the A.N. Association, as well by many of the public and the press, have been greatly appreciated by all, and our heartiest thanks are tendered therefor.

Classes for 1907.

T. Cherry, M.D., M.S., Director of Agriculture.

The number of centres at which classes will be held during 1907 will be limited to 25. The course will last a fortnight, two lectures and demonstrations being given each afternoon, and four limelight lectures on evenings to be arranged with the secretary of each centre. Forty students at least must be enrolled exclusive of school children. The rent of hall and all local charges are paid by the Agricultural Society; all other expenses by the Department. Arrangements must be made to insure the uninterrupted use of the hall during the time the lectures are going on, and tables or desks provided so that students may take notes. The conditions under which medals and prizes are given, are to be subject to approval by the Department. One course each week is compulsory, the second subject being chosen by the local committee from the following list:—

First Week.

Compulsory Subject.

The principles of agriculture.

Optional Subject.

One of the following:—(*a*) Sheep breeding and management (including wool classing and lambs for export); or (*b*) Dairy farming.

Second Week.

Compulsory Subject.

The care of farm animals.

Optional Subject.

One of the following:—(*a*) Poultry breeding and management; (*b*) Agricultural engineering; (*c*) Orchard and garden work.

SYNOPSIS OF LECTURES.

Principles of Agriculture.

1. The plant food of the soil.
2. Cultivation methods and management.
3. Principles of manuring.
4. Valuation of artificial manures.
5. The management of the farm.
6. Experimental plots and their lessons.

Evening lecture—The agricultural resources of Victoria.

The Care of Farm Animals.

1. The structure and care of the horse's foot.
2. Brood mares and breeding mishaps.
3. Colic, constipation, and other bowel complaints.
4. Ailments of dairy cows—milk fever, impaction, udder complaints.
5. Some notifiable diseases—abortion, blackleg, tuberculosis, &c.
6. Ailments of swine, or ailments of sheep.

Demonstrations.

1. Examinations for age, lameness, and unsoundness.
2. Horse shoes and their uses—practical shoeing.
3. Castrating and operating.

Evening Lecture.—(Lantern)—The points of the horse.

Sheep Breeding and Management.

1. The breeding of sheep for wool.
2. Wool sorting and classing, No. 1.
3. Wool sorting and classing, No. 2.
4. Raising fat lambs.
5. Management of flocks.

Evening Lecture.—The wool industry.

Dairy Farming.

1. Breeding and management.
2. Dairy buildings.
3. Dairy management.
4. Milk testing.
5. Foods and feeding.
6. Pig breeding, &c.

Evening Lecture.—Exported products.

PRACTICAL POULTRY BREEDING AND MANAGEMENT.

1. The poultry industry: its importance. Locality suitability, or otherwise.
2. Housing (construction of, materials, insect proof, aspect, &c.), how to select stock.
3. Breeds: payable or otherwise, viz., eggs only. Breeds adopted for export—modes of crossing.
4. Turkeys: their care and management. Chicken raising and care.
5. Foods and feeding (practically demonstrated).
6. Common ailments of poultry (with demonstrations when necessary). Incubation—natural and artificial.

Evening Lecture.—Descriptive of Victoria's progress during the last three years. (Illustrated with 90 new lantern slides.)

AGRICULTURAL ENGINEERING.

1. Water conservation.
2. Irrigation.
3. Drainage.
4. Surveying and measuring.
5. Levelling and setting out.
6. Silo construction, making and using silage.

Evening Lecture.—Irrigation in Victoria.

ORCHARD AND GARDEN WORK.

1. Fruit growing: sorts and localities.
2. Manuring and cultivation.
3. Pruning and management.
4. Insect pests.
5. Fungus diseases.
6. The farmer's garden.

Evening Lecture.—The fruit industry.

Five of these lectures will be given in each course. The one considered least important for local conditions will be omitted.

The organization of the classes will be under the superintendence of Mr. H. V. Hawkins.

THE ORCHARD.

James Lang, Harcourt.

The weather up till lately has been unusually cold for the time of year, and consequently fruit is rather backward. The summer may, however, set in warm at any time, so that orchardists should be prepared by having their orchards thoroughly cultivated and free from weeds; the surface should be kept as loose as possible by means of the scarifier. The spraying for the codlin moth will require constant attention, as it is during the months of January and February, in the warmer districts, that the second brood of grubs hatches. This is the brood that does the greatest damage to the fruit, hence the necessity of spraying at every available opportunity during the months mentioned. Bandages should be examined regularly, and all grubs found destroyed. Orchardists who contemplate shipping a portion of their fruit to oversea markets should at once make arrangements for cool chamber space on board the different fruit-carrying

vessels; if the applications are too long delayed disappointment will be experienced. The crop of apples will be a large one throughout the State, being very much above the average. It will be wise, therefore, to ship a large proportion of the best export varieties; this will relieve the local market very considerably, and insure better prices later on in the season.

All fruit is now shipped under the Commonwealth Commerce Act regulations, and it is recommended that cases guaranteed one bushel net should be used; if cases of any other size are used, the number of apples contained in each case must be marked on the outside of the case. If a distinctive shipping brand is used, it is necessary to register it; but where the full name and address of the shipper are stamped on the end of the case, a registered brand is not required.

Fruit is subject to the usual inspection before being placed on board the vessel, so it will be necessary that only sound, well-conditioned fruit, free from the black spot and codlin moth, is packed. As some of the State inspectors under the Vegetation Diseases Acts have been appointed inspectors under the Commerce Act regulations, the inspection of fruit will be carried out the same as hitherto.

The State Parliament has passed a Fruit Case Bill, which will come into operation on the 1st July, 1907; it makes a bushel case the legal fruit case. This has been very much required for a long time, as cases for many years have been getting smaller every year, until some reputed bushel cases contain very little more than half-a-bushel. Where cases of uniform capacity are used, buyers will know exactly what they are buying, which has not been so hitherto.

Newly-planted citrus fruits will require attention in the way of watering, and also mulching the ground around the roots for about 3 feet; this will prevent evaporation, and give the trees a chance to make a good growth during the summer season. Where water is available, strawberries should be irrigated, to help the second crop to mature.

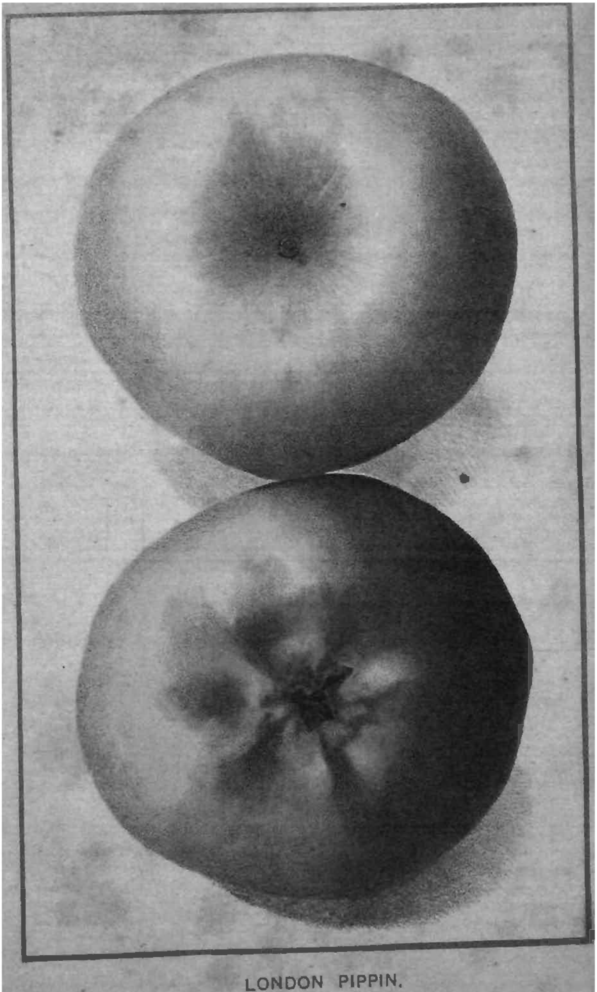
DESCRIPTION OF APPLE.

James Lang, Harcourt.

London Pippin or Five Crown Pippin.

Fruit, medium to large, 3 to 4 inches broad, and $2\frac{3}{4}$ to 3 inches high; roundish and somewhat flattened, with five prominent angles, which extend from the apex half-way down the apple. Skin green at first, becoming a rich golden yellow when fully ripe; it is sometimes flushed with red on the side next the sun, and then has a very beautiful appearance. Eye closed, set in small shallow basin; stalk short, inserted in a deep funnel-like cavity. Flesh yellowish white, crisp and juicy, with a very pleasant flavour. It is good either for dessert or cooking; in season from March till August.

It is a good export apple, and trees are not much affected with the woolly aphis. The tree is a good grower and crops well, forming a large spreading head. It is a popular apple with the growers in the districts around Melbourne, and is very largely grown for market. This is one of the oldest varieties of apples in cultivation in England; Hogg mentions a record of it as far back as 1580.



LONDON PIPPIN.

IMPRESSIONS OF DENMARK.

J. G. McMillan, N.D.D., Cheese Expert.

The first place I visited in the Danish capital was that of the Maypole Dairy Company, which does a large trade in Danish butter, shipping as much as 300 tons per week for its London business. I there met Mr. Vincent, the Danish director of the company, and asked his opinion upon Australian butter. He said that his company was using a great deal of it in England, but was seriously considering discontinuing its use, due, he said, to the irregularity of the quality. It was pointed out to him that our good Australian brands were famed for uniformity, and that his company could not have secured our best butter. He further added that if his firm could depend on uniformity a great deal more of Australian butter might be sold by them. He was also of the opinion that it would be more to the interest of Australia if some butter were kept on the British market all the year round. "Why," he exclaimed, "look at Denmark. The largest output per week is 35,000 cwts., whilst the lowest is 28,000 cwts." These remarks show that the Danish dairyman caters for the English market requirements in regularity of supply, which is worthy of copy and consideration by all interested in Australian dairying.

The next visit was paid to Mr. Svennigsen, of the Alpha-Laval Company, who was good enough to obtain permission for me to visit the buildings of the Danish Milk Supply Company. This company started operations in 1900, the object being to supply milk and cream to the public, guaranteed pure. Both are bottled and corked in the dairy. The milk is obtained entirely from stock which are under the control of the company's veterinary surgeons, who not only regard the state of health of the animals, but also see that there is cleanliness in milking and that the quality of feed is good. The company pays a little more to suppliers for complying with these conditions; in fact, only milk from such is accepted. Yet, though these conditions are enforced, offers from would-be suppliers are continually being received. This system shows how cleanliness combined with keen inspection pays.

Immediately after being drawn from the cow the milk is run over coolers, by which process it is well aerated. As soon as the milk arrives at the company's dairy the contents of each can are thoroughly examined. A little of the milk is taken from the can into a bottle, to the contents of which is added a little white brandy. If coagulation takes place when thus treated the milk is either sent back to the farm or churned; the farmer, however, only gets a low figure for such milk. If the milk is satisfactory it is emptied into the weighing machine and put into tanks, then filtered, heated to 194 degrees Fahr., and cooled down to 39.2 degrees Fahr. The machines in which the pasteurizing is done treat about 2,000 gallons per hour. After the pasteurizing process and cooling, the milk is run into a large tank, and thence into syphons, from which the bottles are filled. The milk is then sent in the company's own carts to the customers.

The most important process that the milk is subjected to is the pasteurization, which is by law made compulsory in all the co-operative dairies of the country, in order to prevent the spread of tubercular and other infectious diseases. That is why the attention of the Danish Milk Company has been centred on this special point. Particular care is taken not

to allow any milk to leave the pasteurizing machine without being sufficiently heated. During the whole process of pasteurization a man has the special task of watching two thermometers on each machine, which are placed at the outlet through which the milk has to pass. He has strict orders not to allow the temperature to go below about 185 Fahr. These thermometers are frequently compared with controlling thermometers. Furthermore, as long as the pasteurization lasts an inspector often takes samples from the tank where the pasteurized milk is collected, and tests whether they are sufficiently heated. The controlling medical officer of the company daily examines samples of the pasteurized milk, so that the certainty of the milk being pasteurized is sufficiently established.

The washing of the bottles is performed in a very expeditious manner. For this purpose there is a big revolving disc, with cells, each large enough to hold one bottle. Into these cells the dirty bottles are placed by an operator, and as the disc is slowly turned downwards the bottles enter a trough containing strong sodawater, with which they are filled. As the disc revolves the full bottles come out at the other side, from which they are taken by another operator, who places them on a revolving brush, by which they are thoroughly washed. The bottles are afterwards placed over a jet, from which water of any temperature can be obtained, and they are then placed in a position to drain. Girls do all this work, and are very smart and careful; but the breakage of glass is considerable. The bottles are filled by inserting them on little syphons, which have a ring of rubber on the end which is inserted in the milk. When the bottle is placed on the syphon it immediately begins to fill, and when taken off, the syphon, by means of the rubber band pressing freely on the tinware, ceases running. This is not only an expeditious, but also a clean way of filling.

The children's milk is supplied to the company from two farms, which have for several years been controlled by the Veterinary and Agricultural School of Copenhagen. The stock is examined twice a month by Professor Bang or his assistant. Injections of tuberculin are given twice a year, and if any animals react they are immediately removed from the farm. The company can thus give a guarantee that the children's milk is from sound cows only. The composition of the food, the cleanliness in and near the cow-houses, and the state of health and cleanliness of the employés at the farm, receive every attention, as well as the cooling down and airing of the milk, which are performed with the greatest possible care immediately after the milking. Besides the bottled milk department, the company has an extensive wholesale business, distributing from 70,000 to 90,000 lbs. milk and cream daily. On an average about 12,000 gallons of milk and cream per day are sold. A considerable quantity of butter is made for customers; any milk that is hardly up to the requirements for pasteurizing, and also milk that may have been unsold, is made into butter. Women do most of the butter-making. The skim and butter milk are also sold in the city. The delivery vans are particularly neat and clean.

A Co-operative Bacon Factory.

Passing from the study of pure milk supply to that of a co-operative bacon factory is probably a big jump. Still, the supply of good, wholesome bacon is as essential as good milk. If there is one department of Australian agriculture which is neglected to a great extent it is that of

pig rearing and fattening. Certainly a fair amount of bacon is produced, but nothing like what ought to be; particularly in the matter of curing very little is done by our farmers, many of whom seem to have a distaste for pigs, at least as farm stock. Not so the Dane or the Irishman, as both find the pig a great source of wealth, and we are all familiar with the saying attributed to the small Irish farmer that "the pig is the 'gintleman' that pays the rent." There is much more truth in this than is generally supposed. Before leaving Victoria I was asked to make some inquiries into bacon producing as carried on in other countries. Accordingly a visit was paid to a factory at Haslev, which was started in 1901. Previous to this, a meeting of farmers in the neighbourhood was held, when it was agreed to form a company and start a factory. Each farmer guaranteed to supply so many pigs per annum; for instance, one would guarantee twenty, another fifty, another 100, and so on, smaller quantities, of course, being taken. Each intending supplier had to give a further guarantee of six kroner (6s. 9d.) for every pig he had agreed to supply. A proper form of guarantee was drawn out, and signed by each pledged supplier. This was taken and presented to the bank, which was satisfied with the signatures, and advanced enough capital wherewith to erect buildings and provide plant, &c. A rule of the Haslev Company is that the whole of the capital must be paid off in twenty-seven years; one twenty-seventh of his guarantee is therefore deducted from the supplier annually until all is paid off.

Hasley factory is situated on the outskirts of the town; the buildings are lofty, well aired, and ample for the business. The pigs of about 135 to 140 lbs. weight are most favoured. The farmers bring them in by cart or forward by rail. The number slaughtered daily varies from seventy to 100, each carcass being consecutively numbered as soon as the various operations are completed. The live pigs are driven into a pen, where a chain with a running noose is passed round the hind leg. The animals when packed fairly close in the pen stand quietly, so that one man can put on the chains very easily at the rate of two per minute. The chains are from 3 to 3½ feet long, and on the opposite end from the noose a combined ring and hook is placed. Along the side of the catching pen there slowly revolves a large wheel, 7 or 8 feet in diameter, round the periphery of which three pins stick out on one side. As soon as the attendant has got a pig by the foot he slips the ring at the end of the chain on one of the pins in this wheel, which gently lifts up the pig by the hind leg over the wall of the catching pen. At this point the hook, which is part of the hoisting ring, automatically drops on to a well-greased rail, and an instant later the ring slips off the pin on the side of the wheel. As soon as this happens the hook and pig slide along the rail to the slaughterer, who, with a well-directed thrust, cuts its throat, and allows it to pass on to the bleeding-pen. The hanging position of the pig permits of bleeding being done quickly and thoroughly, so that this most disagreeable part of the process of bacon curing is got through in the least possible time. The carcass is then passed into a furnace for a few seconds to singe. This done, it is passed on to the scalding bath, and kept for a few minutes. When sufficiently scalded the carcass is pulled from the bath on to a pair of revolving brushes. These run in opposite directions, and, instead of being straight, are curved so as to represent as nearly as possible the curvature of the body from the tail to the nose. The brushes run at a fairly high speed, and vary in diameter from 1 to 2 feet. While the carcass lies in the hollow between the two rollers

the brushes keep turning it round and round, and in a short time it is well cleaned. It is then pulled forward on to a table, where men with knives scrape off any hair that may escape the previous operations. The carcass is then dropped into a bath of cold water, in order to get rid of the heat imparted to it during singeing and scalding, and any particles of dirt that may have become attached. From the cold water bath the carcass is now raised to another rail, along which it glides to the men who remove the intestines, after which it is numbered. After the numbering has been completed the carcasses pass on by various lines of rails to the cooling chambers, of which there are several. When the cooling is completed the carcasses are again slid out on rails to another apartment, where they are cut into sides. As there are several cooling chambers, which are kept at a temperature of about 40 Fahr., there is no interruption to the work of slaughtering or cutting up while any chamber is being filled or emptied, or while the carcasses remain; in ordinary working one will be filled with carcasses in the process of cooling, while another is being emptied and a third filled. After being cut up, the parts are taken to the cellars, where they are subjected to various degrees and methods of salting. The bulk of the process is, however, carried out on the dry salting method. There is a process in use at certain factories which was not noticed at Haslev, although explained to me. It is called the "injection process" of preserving. To a powerful force pump a strong flexible tube, terminating in a hollow needle, is attached. This needle is about 8 inches in length and ¼ inch thick, and towards the point for about 2 inches are a number of small holes. In operation one man works the pump and another sticks the needle into the ham, &c., at 4 to 5 inches apart. He allows it to remain in each place for a second or two, so that the brine under heavy pressure may permeate the flesh around. The sides are piled in layers in a cool room, and, when ready, packed in linen wrappers (four sides in one wrapper) and sent off to the British market, arriving in London when only about fourteen days old.

The offal is all cleaned out and carefully washed, each part being devoted to some particular purpose. The bladders, after washing, are all mechanically filled with air by temporarily pressing them on to a small pipe containing air under pressure. The lard is all melted in special boilers, from which pipes run to the filling room, where the bladders are again attached to pipes, and the hot lard is forced into them, without coming in contact with the air, or any outside contamination. As soon as filled, and before it is withdrawn from the pipe, the bladder is tied at the neck, so that pollution cannot occur later on. Sometimes part of the lard is put in casks. Cleanliness is observed in every operation.

As to the success of the co-operative bacon factory system there is not the least doubt. During the five years that the Haslev slaughtering establishment has been in existence, the average price paid to suppliers, after deductions, paying off capital, depreciation, working expenses, &c., has been as follows:—

1901	44	ore per lb.
1902	45	" " "
1903	41½	" " "
1904	37	" " "
1905	44⅓	" " "
Average	42.36	" " "

100 ore = 1s. 1½d.; 101.55 lbs. Danish = 112 lbs. English.

From this table we see that the price per lb. to the supplier is about 5¼d. per English lb., or about £3 per pig, a splendid average price for so many years.

Besides doing a large trade in bacon, this company handles a great number of eggs. Each supplier is given a number, which he puts on every egg. Once or twice a week a cart goes round collecting. When it arrives at the receiving station the eggs from each supplier are taken charge of and graded, the weights varying from 14 to 18 lbs. per hundred. The different weights are placed on separate trays, which have a space for each egg. These trays are then taken to a dark room and placed over a strong light. If any eggs are found to be faulty they are returned to the supplier, who is cautioned. If a second offence occurs the supplier is fined 1 krone (1s. 1½d.) for every bad egg, and for a third offence is prohibited from supplying. Eggs are bought by the pound, prices varying from 38 to 90 ore (4½d. to 11¼d.), according to time of year.

A MODEL DAIRY FACTORY.

For any one interested in dairying to visit Denmark without seeing the Trifolium factory would be similar to a Mohammedan going to Mecca and not visiting the tomb of the prophet. This fine factory is situated close to the town of Haslev, about 30 miles from Copenhagen. All around the country is admirably adapted for dairying. Everywhere the traveller casts his eye methodical agriculture is shown. The motto of the Danish farmer seems to be that well-known adage, "Waste not, want not." Every corner of land is utilized, and if not good enough for cultivation is planted with trees. Few fences are to be seen; thus little land is wasted in this way, though several crops, such as pasture, barley, oats, green crop, may be in one field. To prevent the cows which graze on the part under grass trespassing they are tethered to stakes by means of long ropes. The farmer comes out occasionally during the day, and removes the stakes to other parts of the field, thus preventing any one particular part from becoming foul. The cows were all rugged, although the weather was fairly warm. The water supply is very good, and the pastures very clean. Everything about the farm buildings is tidy. The cow-sheds, however, were not so good as in some countries, the animals not having enough room behind them. Although the Danes are so much ahead in other matters connected with dairying, they seemed to be lax in regard to the keeping of sheds. For instance, in a byre at an agricultural college there was a stall with no cows in, but which was occupied by a sow and her progeny. It is hardly necessary to mention that there was an odour anything but favorable to the production of pure milk.

The cows are mostly of the red Holstein breed. One that does not give an average yield of 700 to 800 gallons per annum is thought little of. The show cow as known in Australia is unknown in Denmark. Whilst the Australian breeder goes in for symmetry of body and fine appearance, the Dane judges a cow mainly by her milking properties. Records are kept; only the calves from the best cows are retained, and these are well looked after from their youth upwards. The farms are mostly small in extent, and generally owned by the farmers themselves. There are, however, some large estates, but even on many of these the tenants become their own landlords in due course, as they are paying off so much per year as rent and capital.

Under such ideal surroundings it is not to be wondered that one of the finest factories in the world stands. The milk supplied per annum is about 37,000,000 lbs., and is evenly distributed over the year. This factory claims to be the biggest of its kind in the world. Almost every day people from foreign parts visit it. There are two creameries connected with it.

The milk waggons are supplied by the factory, and are built in tiers, so that three rows of cans can be placed one upon the other. These waggons are lent out to the farmers, who have a mutual agreement amongst themselves regarding each one's time of carting the milk to the factory. One man, for instance, may send 50 gallons per day, whilst his neighbour only 25 gallons, therefore the man who sends the large amount has to go twice for the other man's once. This is a good system where the dairies are small and the roads good. The roads in Denmark are excellent, and therefore easy for transit. The method of working is much the same as in any of our good Australian factories. In some things, however, the Dane is ahead.

The milk is taken from the waggons, weighed, sampled, and emptied into tanks. The empty cans are placed mouth downward on an automatic carrier, which conveys them to the wash-room. Whilst on this the cans drip, the drippings amounting from 15 to 20 gallons per day, thus bearing out the statement that the Dane does not waste. The cans are well washed and steamed before being returned to the platform.

From the large receiving tanks the milk passes into the pasteurizers, when it is heated to 190 Fahr. By an ingenious arrangement the heated milk is cooled down to about 130 Fahr. by the cold milk which is entering, and at this temperature it is separated. The cream is cooled over a circular cooler to the desired temperature for ripening. Brine is used for the cooling. The skim milk that is to be sent back to the farmers is again heated to 190 Fahr., and cooled down to 39.2 Fahr.; it is then weighed automatically into the cans, which are then placed in the waggons. When skim milk is required for cheese-making the new milk is not pasteurized previous to separation, but only raised to a suitable temperature for skimming. The cream is then pasteurized at 194 degrees Fahr., cooled in the usual way, and run into large tanks in a special room. Here the pure culture starter is added, and ripening allowed to proceed. There are six large churns, each making about 400 lbs. butter. An hour is allowed for the churning process. The butter-milk is run off through pipes into a large tank, and from thence forwarded to customers, or to the cheese-making room when it is used largely. After the butter-milk is drawn the butter is given two washings, and is placed on the worker, which is of stone, and salt added. After a slight working the butter is placed in large wooden tubs containing cold water; whilst here the salt dissolves and the butter firms up. After a short interval the working is completed, the turning of the butter being entirely done with the bare hands. The finished product is then placed firmly into casks, which are lined with parchment paper or muslin. No preservative other than salt is allowed to be used. Most of the work is done by women, superintended by a master. There are several cool rooms, in which the butter is placed immediately after packing. The butter is sent to England three times per week, *viâ* Esberg, which is the quickest route, thus arriving on the British market in a very fresh condition. About 30,000 lbs, butter are made every week.

(*To be continued.*)

DISEASES OF FARM ANIMALS.

(Continued from page 755, Vol. IV.)

S. S. Cameron, M.R.C.V.S., Chief Veterinary Officer.

VI.—VETERINARY OPERATIONS, METHODS, AND PRACTICES.

I. OPERATIONS.—Precautions Prior to Operations, Preparation, Antiseptic Surgery—Control during Operations, the Twitch, the Side line, Strapping Limbs, the Trevis or Crush, Operating Tables, Throwing Horses, Throwing Cattle—Anaesthetics (Chloroforming), General Anæsthesia, Local Anæsthesia—*Abscess Lancing—Arrest of Bleeding—Amputation of the Penis—Blood-letting—Cæsarian Operation*—Castration, Recumbent Position, Methods (Searing, Caustic Clams, Torsion, Ecraseur, Forceps and Emasculators) Standing Operation, Untoward Results (Hæmorrhage, After-swelling, Septic Peritonitis, Rupture or Scrotol Hernia), Castration of Bulls and Lambs, Castration of Ruptured Horses (the Covered Operation)—Castration or Speying of Mares—Speying Cattle—Embryotomy—Firing—*Impregnation (Artificial)—Neurotomy and Neurectomy—Rumenotomy and Gastrotomy—Suturing* Wounds—Tracheotomy, Tenotomy—Trepanning.

II. METHODS AND PRACTICES.—Bandaging and Massage—Backraking—Blistering—Catheter (passing the)—Enemata—Fomenting, Bathing, and Poulticing—Slinging.

In writing on animal diseases, reference needs to be frequently made to what may be termed common operations and to various methods and practices in common use by veterinary surgeons in their calling. These concern both diagnosis and treatment, and it is here proposed to describe shortly the more ordinary of them.

I. -Operations.

PRECAUTIONS PRIOR TO OPERATIONS.

PREPARATION.—Animals that are to be the subjects of major operations involving throwing or chloroforming, should be specially prepared for a few days beforehand by dieting. The food should be non-heating and reduced in quantity. Animals in store condition are the best subjects for operation. Those that are gross or fat, or in a highly-trained condition, should be reduced by the giving of purgative medicine and suitable exercise. If time will permit of choice as to weather conditions, operations should not be performed in bleak cold or wet weather, even though the animal is to be kept under cover subsequently.

ANTISEPTIC SURGERY.—Nowadays, the risk that used to accompany many operations is done away with by the adoption of strictly antiseptic surgery. This involves:—

(*a*) *The sterilization of all instruments used.*—This may be best secured by the washing and boiling in water, to which a little carbonate of soda has been added, of all metal instruments immediately after use. On being put away they should be smeared with carbolic oil or some other rust-preventing antiseptic. Instruments composed of material that will not stand boiling, such as rubber and gum elastic, may be sterilized by soaking in a strong antiseptic solution. The boiling above described, or sterilizing with dry heat in an oven, or by passing through a bunsen flame, ought to be repeated immediately prior to use.

(*b*) *The cleansing of the seat of the operation.*—Close clipping or shaving of the hair is essential to thorough cleansing. A subsequent washing with soap and water should be carried out, and, immediately prior to operating, the part should be rendered a-septic by sponging with alcohol or other antiseptic that will blend with the skin.

(*c*) *The sterilization of the hands of the operator.*—Thorough washing with soap and water is necessary, especial attention being paid to the nails; after which the hands should be sponged with alcohol or smeared with carbolized oil, according to the requirement of the operation. If possible, the operator should not himself assist in the throwing or securing of the patient, or in any work likely to contaminate his hands.

(*d*) *Avoidance of contamination of operation wounds.*—Clean straw makes the most suitable bed for operating on. It is almost impossible to carry out strictly antiseptic surgery if beds of dusty tan or sand, or manure are used. The particular part to be operated on may be protected by having towelling or sheeting placed under it, particularly in chloroform operations.

(*e*) *The antiseptic dressing of operation wounds.* — Methods will be described later on, when the treatment of wounds is being dealt with.

THE CONTROL OF ANIMALS DURING OPERATIONS.

Various devices have to be used to control animals during the performance of operations, not only for the avoidance of risk to the operator, but also that the part to be operated upon may be fixed or exposed in proper position. The most essential requirement in this regard is perhaps that the man in charge of the horse's head should be a knowledgeable horseman, strong, active, alert, handy, and, above all, game and fearless, for on him will it often depend to give warning, and, by his handling of his charge, to prevent danger to both the operator and the animal.

The TWITCH is a common means of controlling horses or attracting their attention during the performance of minor operations. It consists of a stout stick having a loop of cord at the end which is twisted round the part to which it is applied so causing compression and certain amount of pain. The twitch is usually applied to the upper lip or muzzle, a part extremely well supplied with sensory nerve filaments, which are apparently benumbed by the operation. It is sometimes also applied to the ears and to the lower jaw behind the incisor teeth.

The SIDE LINE is a loop of rope passed round the neck in front of the shoulders, and having a free end, which is passed round the hind pastern and back to the neck loop. When adjusted and drawn up fairly tight, it prevents the free use of the leg round which it is passed, and so allows of some operations being performed without risk of kicking. If it is required to control both hind limbs, double side lines are used. (See Fig. 1.)

STRAPPING the limbs in various positions is often adopted, a stirrup leather being a most useful instrument in this connexion. A horse cannot well kick if made to stand on three legs. This may be done by bending one fore leg up and strapping it by means of a stirrup leather round the pastern and upper part of the arm. The hind limbs may be hobbled together by applying the stirrup leather round both, either above or below the hocks. Punching may be prevented by hobbling the fore limbs in like manner.

THE TREVIS OR CRUSH.—A favorite method of securing horses and cattle for operations in Australia is the fixing of them in a crush, the construction and uses of which are familiar to most stockmen, seeing that such a structure is to be found erected in almost every stockyard throughout the land. Many of them are very ingeniously designed, so that they may

be adapted for the use of different kinds of animals and different operations. A trevis is merely a crush provided with back and belly straps, breast straps, and breeching, and with rings and rope holes for the more effective securing of the animal in suitable positions for operation.

At times it is necessary to improvise a method of fixing animals for operations when no crush is available, and when, for various reasons, it is considered inadvisable to throw the animal. One of the handiest and best means is to rope the animal to a stout post-and-rail fence in the manner advised in connexion with operations for fistulous withers.

OPERATING TABLES.—Very effective operating tables have been designed for larger animals, but their great cost is a bar to their general use. In most of these, the top of the table is made to swing over into the vertical position, and the horse is ranged up alongside and strapped to it. The table is then returned to the horizontal position, and the animal fixed in any position that is desired by means of straps and other ingeniously arranged fittings. An equine operating table of the most approved pattern (Dollar's combined) is in regular use at the Veterinary Hospital established by Mr. E. F. J. Bordeaux, G.M.V.C., Moonee Ponds, Victoria, who speaks highly of its effectiveness and suitability.

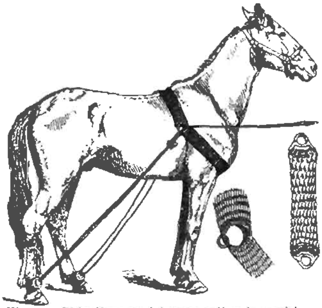


Fig. 1.—Side lines and breast collar in position.

THROWING HORSES.—The "side-line" method of throwing horses is described in connexion with "Castration." Various other methods of throwing are adopted in Australia, but they are likely to be so well known to most readers, that it is not intended to occupy space with descriptions of them. It will be appropriate, however, to say that many of the accidents which constantly occur nowadays might be avoided if more gentle handling was practised during the "roping down" of horses, and if a soft throwing bed was provided. Especial care should be taken with very old horses whose bones are fragile, and with young horses suffering from nasal disease or other general bone complaint. In such cases, there is less risk if throwing hobbles are used; indeed, veterinary surgeons always prefer to use the patent hobbles when throwing for operations, because not only is the fall effected less heavily, but there is always the great advantage that any limb that is required can be set free and fixed in any desired position,

without the necessity of disturbing the other limbs or loosening any tie-ropes.

A point essential to safety when a horse is thrown is, that the head should be constantly kept down on the ground. With the head kept down, horses invariably refrain from struggling or attempting to rise, in fact, they are powerless to rise when the head is close on the ground. This latter statement ought to be qualified somewhat in regard to horses that are under the influence of chloroform, because in the delirious stage of chloroform anæsthesia, the controlling influence of keeping the head down is often not apparent.

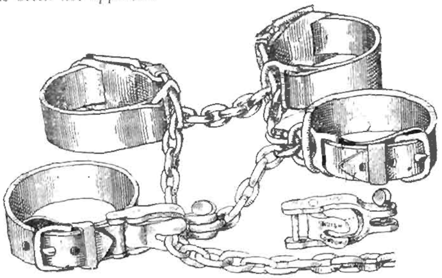


Fig. 2.—Throwing hobbles.

THROWING CATTLE.—To safely and easily throw calves for castration or other operation, attach a strap or rope round the pastern or above the fetlock of the fore and hind limbs of the side on which it is desired the animal should lie; then pass the ends of the rope to the opposite side and pull on them, at the same time giving the body a push over from the pulling side.

To throw bulls or non-pregnant cows, advantage is taken of the fact that when they are nipped or compressed round the flank and chest they will almost invariably roll over or lie down. A long rope is required, and it is attached by one end round the horns or neck, or to the halter. It is then passed along the top of the neck, and given a half hitch round it. A second half hitch is made round the chest, but with the direction of the hitch reversed, and, again reversing, a third half hitch is made round the loins and flank, just in front of the hip points. A backward haul is then made on the rope end, so as to tighten the hitches and compress the chest and flanks, and the animal will quickly go down, and may be secured in any position desired by roping the limbs.

ANÆSTHETICS (CHLOROFORMING).

GENERAL ANÆSTHESIA.—The use of anæsthetics in veterinary practice has become very general latterly, and for all major operations on valuable animals the patient is almost invariably first placed under the influence of chloroform. The A.E.C. mixture (alcohol, 1 part; ether, 2 parts; and chloroform, 3 parts) is sometimes used, it being claimed that the ether counteracts the depressing action of chloroform on the heart (the

alcohol merely acting as a blending agent). Methylated chloroform is found to be as safe and effective for veterinary patients as pure chloroform, and it is much less expensive—a consideration that cannot be ignored in view of the dose required for the larger animals.

Fig. 3.—Chloroform mask for horses.

Horses to be chloroformed should always be first thrown. The effect of the drug in some cases is to produce a primary delirium, during which the animal becomes unconsciously violent and uncontrollable, and there is therefore considerable danger to both the operator and the patient if the latter has not been previously secured properly.

A specially constructed chloroform inhaler is sometimes used (see Fig 3), but the simplest method of administering chloroform to horses or cattle is by inhalation from a sponge saturated with the drug.

The sponge is placed over one nostril and kept in position by means of a towel. The other nostril should be left free for the inhalation of air. By restricting the amount of air so inhaled with the hand, the inspiration of chloroform through the other nostril can be increased.

A varying amount of chloroform is required for different animals, some horses becoming insensible with 2 ounces, while others require as much as half a pint. It is advisable, therefore, to give it gradually, using about 2 ounces at first, and replenishing the sponge with half that amount from time to time, until (in from 5 to 15 minutes) insensibility is produced. This is best ascertained by noting the reaction of the eye to the finger touch. The internal angle of the eye is most sensitive, and if, when the haw is touched in this position, there is no winking, it may be concluded that the anæsthesia is complete. The tail also becomes flaccid, and there will be no sensibility to the prick of a pin or pen knife at other parts of the body.

While the animal is under the influence of chloroform, the pulse should be noted to be full and strong, and the breathing deep and slow. If

the pulse fails or the breathing becomes shallow and distressful, the administration of the drug should be stopped, and steps taken to revive the animal. A full current of air should be allowed; the animal should be turned over and a cold douche applied to the head. Rhythmical movement of the fore limbs, with the object of inducing artificial respiration, may be tried, and the inhalation of the fumes of strong ammonia may require to be resorted to. Horses, however, are not so liable to become asphyxiated under chloroform as human patients, and they more quickly recover from its effects. Sometimes they may lie for an hour or so "sleeping off the effects," and they may require a little help and manual steadying in rising, and until "they find their legs."

To dogs chloroform is usually administered from a sponge in a pill box applied to the nostrils, and they usually require from a dram to an ounce, according to size and temperament. In dogs the respiration is always more embarrassed and fatalities more frequent than in horses.

LOCAL ANÆSTHESIA is also largely availed of in performing operations on animals. A 4 per cent. solution of cocaine in sterilized water is the agent usually employed. Its action is to paralyze the sensory nerves of the part to which it is applied, and it is particularly effective in producing insensibility of mucous membranes. It is therefore very useful in operations on the eye. Its action on the skin is more tardy, but it nevertheless produces sufficient local insensibility as to permit of minor operations being performed without trouble. A more pronounced effect is produced locally if the solution is injected under the skin adjacent to the part to be operated on. For this purpose, a stronger solution (8 or 10 per cent.) may be used. The addition of morphia (1 to 2 per cent.) or of eucaine, is stated to considerably accentuate the action of cocaine as a local anæsthetic. Adrenalin and storaine, particularly the former, have also recently come into successful use in veterinary practice.

ABSCESS LANCING.

The opening of an abscess or cyst is a very simple operation. A large incision is usually preferable, as it affords better means for complete evacuation of the contained matter, and also for subsequent dressing or cleaning by means of antiseptic injections. The incision should always be made at the lower part of the abscess, or, indeed, of any sinus or wound that is being lanced, so that free drainage of matter may be effected and "pocketing" avoided.

ARREST OF BLEEDING.

INTERNAL BLEEDING.—When hæmorrhage from an internal organ is suspected, the golden rule is to keep the animal as quiet as possible, and to this end a stiff dose of opium or other sedative medicine is advantageous. In such cases, opium has the added merit that it may act as a *styptic* or *astringent*, and so assist in stopping the bleeding. Another medicine which has a powerful effect in arresting internal hæmorrhage is ergot of rye, which may be given by the mouth or injected under the skin or into the blood stream in the form of liquid extract of ergot, the dose of which for a horse or cow is from half an ounce to an ounce. The most marked sign of internal hæmorrhage is a sudden paleness of the visible mucous membrane.

EXTERNAL BLEEDING.—Except it is excessive to a degree likely to become exhausting, external bleeding is not such an alarming affair as is usually thought. Unless the bleeding vessel is a comparatively large

artery, it is surprising how quickly it will close if the animal is kept still. Much apprehension need not be felt unless the blood is spurting in jets. The bleeding from an operation wound is usually much more serious than that from an accidental wound, because in the latter case the vessel is usually torn asunder, while in the former the cut is usually a clean one, and there is no tendency for the vessel to become plugged by the tiny shreds of torn tissue round which clotting occurs so quickly.

In the case of a large vessel being cut during an operation, the safest plan is to secure the bleeding end with a pair of forceps, and either apply a silk ligature, or twist the vessel until the end is almost torn off. Failing this, the wound should be sluiced with a solution of perchloride of iron, plugged with cotton wool or antiseptic tow, and stitched up. The object of this procedure is to get a quick clotting of the blood, by which the cut vessel ultimately becomes plugged. The application of cold water or ice to the part, by producing contraction of the blood vessels supplying it, is also helpful. Cold water continuously played on the loins is particularly useful in bleeding from the cord after castration, or from the womb after calving or foaling. In the latter cases, the flooding of the womb with cold water, or even the insertion of a chunk of ice, may have to be resorted to.

When the bleeding is from one of the large vessels of the limbs, the application of pressure above the seat of bleeding by means of a tourniquet or tight bandage is very effective. If pressure is applied directly to the main vessel of supply, by means of a cork, plug of grass, or some such substance, held in position with the bandage, the bleeding will cease almost directly; but an exact knowledge of the vascular anatomy of the part is necessary to effectively accomplish this.

To avoid excessive bleeding while operating on the limbs, it is always advisable to apply a bandage or tourniquet to the limb above the seat of operation. For operations in other parts, the prior injection of adrenalin has recently been practised extensively to produce a transient bloodlessness, but its use in those cases which have come under the author's observation has not been so completely successful as was expected.

AMPUTATION OF THE PENIS.

For this operation the animal will usually need to be cast, especially if a bull is the subject of operation. A catheter is passed into the urethral tube and retained in position by a tight ligature round the penis behind the seat of the proposed amputation. A circular incision is then made, cutting down on to the catheter. The ligature and catheter are allowed to remain in position for at least twenty-four hours—the former to prevent excessive bleeding, and the latter so that the discharging urine may not be interfered with. It is not necessary to stitch the edges of the wound. Ordinary wound treatment will suffice to complete the healing.

BLOOD-LETTING.

"Bleeding" or the extraction of blood, which was commonly practised for a number of diseases in days gone by, is now only advised in cases of passive congestion of the lungs and some few other conditions. It is most easily done by opening the jugular vein at the upper third of the neck. A cord or strap (a stirrup leather does very well) is first applied tightly round the neck about midway between the head and chest, so that

the pressure will impede the flow of blood, and distend the vein. The vein is opened either with a lancet or fleam. When using the lancet the skin is first cut and the vein exposed, the lancet being then inserted lengthways of the vein. With the fleam the skin and vein are incised at the same time, the fleam blade being placed lengthways along the distended vein, and given a smart stroke with a billet of wood or other solid instrument. When sufficient blood has exuded (about a gallon is usually considered a fair bleeding), the strap is loosened and the blood at once ceases to flow the current being now unimpeded, it passes direct along the vein. The wound should be closed by a pin suture—made by inserting a pin through the lips and tying it by winding horse hair round the ends.

CÆSARIAN OPERATION.

The Cæsarian operation, so called because of the tradition that Julius Cæsar was brought into the world in this artificial way, or, as Shakespeare has it, "ripped untimely from his mother's womb," is performed on domestic animals, most frequently on small bitches whose alliance with dogs of larger size has resulted in the formation of fœtuses too large to be born in the natural way. It may also be performed with success in those cases in which the passage is so tumified and swollen as to prevent natural parturition, and also in many cases of difficult parturition, in which malformations or monstrostites are known or suspected. In difficult parturition of the sow, either from misplacement or abnormality of the fœtuses or from maternal weakness, the Cæsarian operation is very frequently successful, not only in preserving the lives of the young, but in the majority of cases, of the mother also.

The operation is best performed under chloroform, and the instruments and apparatus required are a scalpel, probe-pointed bistoury, and scissors, probe director, suture needles, catgut, broad linen bandage, and a large calico sheet, all rendered aseptic.

The animal should be laid on its side with the hind limbs tied and drawn backwards. The abdomen and teats must be washed and rendered aseptic in the usual manner. A horizontal incision from 3 to 5 inches long is then made in the abdomen, from ½ inch to 1 inch above the line of demarcation formed by the mammary glands, any large vessels cut being either twisted or ligatured. The peritoneum is then punctured with the finger, and the opening enlarged as required with the scissors. The intestines are then pushed forward and the uterus brought outside and laid on the calico sheet previously soaked with creolin solution. The uppermost horn of the womb is then incised lengthways for 3 or 4 inches, and the fœtuses contained in it, with their membranes, extracted. The hand is then passed into the womb through the incision, and the fœtuses contained in the other horn similarly removed. Any blood clots and torn membranes should also be removed, and the womb carefully cleaned with antiseptic solution. The incision in the wall of the womb is then sutured with aseptic catgut, and the organ returned inside the abdominal cavity. Concerning the external wound, the abdominal muscles and the skin should be stitched separately. This wound should be dusted over with an antiseptic powder, and the broad linen bandages then applied as a compress for six or seven days, during which the diet should consist of milk, water, and other light foods.

CASTRATION.

An article by the present writer on "Castration of farm animals" appeared in the *Journal* of October, 1906, q.v. There will be found a description of the use of the instrument shown in Fig. 4.

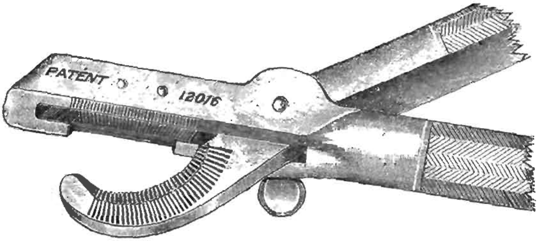


Fig. 4.—Castrator.

SPEYING OR CASTRATION OF THE MARE.

On account of the great liability to fatal peritonitis following upon wounds in the abdomen of horses, the operation of speying mares is only safe when performed *per vaginum*. The mare may be chloroformed, or local anæsthesia may be produced by inserting a cocaine-soaked pledget of cotton-wool into the vagina, as far as the neck of the womb, a little time before commencing. The strictest antiseptic precautions are necessary; the operator's hands and arms, the instruments to be used, and the external parts being disinfected with a lysol solution (1 in 100) or corrosive sublimate solution (1 in 1,000). Before proceeding, the rectum should be emptied.

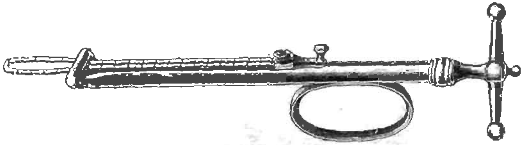


Fig. 5.—Chain Ecraseur.

Two instruments are necessary—a concealed bistoury and an écraseur. With the bistoury a puncture is made in the upper part of the vagina through the vaginal wall, in the middle line, immediately above the neck of the womb (*os uteri*). The finger is inserted into this wound, and it is enlarged by tearing until the hand can be introduced. The ovaries are then searched for, grasped, and pulled through the opening, when they can be removed with the écraseur, for operating which see article on "Castration" in October, 1906, issue of the *Journal*.

SPEYING CATTLE (OVARIOTOMY).

The most suitable age for speying cattle is prior to the first calf. At this period there is the minimum risk of mishap. If older cows are to be speyed, they should be in store condition, and not in calf. In-calf cows often slip their calves after speying. The operation should not be performed on cows in season, nor within a month after calving. The most suitable time for speying is the early summer, when the nights are warm and dry. The subjects for operation should be kept short of food for twenty-four hours before.

There are two methods of operation in vogue, viz., the flank operation and the operation *per vaginum*. Where considerable numbers are to be speyed, the flank operation is usually preferred. The cattle are secured in a long narrow race or crush, with fence-work sides, so that the operator can work through the rails. When the numbers are few, they may be tied or strapped, right side on, to an ordinary three-rail fence. The seat of operation through the flank is on the right side, in a position similar to that described for gastrotomy, and the incision is made in the same direction, downwards and forwards across the direction of the hair down to the peritoneum. The right side is chosen in preference to the left, because the operator's manipulation is not interfered with by the presence of the distended paunch. Before making the incision, the hair should be clipped off an oblique strip, and the part washed with an antiseptic solution. The hands and arms of the operator should also be similarly washed between each operation. The peritoneum or thin membrane lining the abdominal cavity should not be broken until the hæmorrhage from the outside wound is somewhat allayed. It is then cut through, and the hand introduced into the abdominal cavity in search of the ovaries. The one furthest away (the left one) should be grasped first, and removed from its corded attachment by snipping with knife or scissors, or, if it is desired to avoid hæmorrhage totally, the écraseur is used. The right ovary is then grasped and removed. Some operators stitch the peritoneum, the muscles, and the skin separately, but this is scarcely necessary. Usually the wound is stitched with three or four strong sutures, taking in a half-inch of skin at each side. A dressing of carbolized oil or tar is then smeared over the surface, and the operation is complete. The vaginal operation on cattle is performed as described above for mares, except that it is not at all necessary to use chloroform or local anæsthetics.

(*To be continued.*)

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DISEASES OF FARM ANIMALS.

(Continued from page 64.)

S. S. Cameron, M.R.C.V.S., Chief Veterinary Officer.

VI.—VETERINARY OPERATIONS, METHODS, AND PRACTICES.

I.—Operations—*continued.*

Embryotomy.

This is an operation involving the cutting out of the fœtus or unborn young. It has to be performed in some cases of difficult parturition, in order that the mother's life may be saved, when, from either the great size or some other abnormality of the fœtus, it cannot be passed out of the womb or removed whole. Embryotomy is always a serious and tedious undertaking, for the fœtus has usually to be cut away limb by limb and piece by piece, and besides it is only possible to use one hand, because of the constricted character of the passage. While a skilful practitioner can remove a limb when in normal position with apparently little trouble, the alteration in position of the limbs or other parts of the fœtus, which renders the operation necessary, also makes the removal a matter of great difficulty.

Although it is not hoped by written description to convey a full conception of the method of an operation, which, above all things, requires experience and actual practice, still some information may be given by the application of which total failure may be avoided. A description of the removal of a fore limb will serve to indicate the methods to be adopted in the removal of other limbs or parts. The instruments required are a wooden or bone spatula, about an inch wide, and with a rounded blunt extremity, and a curved knife with blunt point, and provided with a ring for a fingerhold. Both instruments should be attached to a string before being introduced, so that, if they are lost inside, they may be withdrawn.

As a preliminary measure, a cord must be attached to the foot or any other part that is available, in order that it may be kept in position, and

not allowed to slip back at any time. The whole of the manipulations should, if possible, be done under the skin (sub-cutaneous embryotomy), so that the wall of the womb and passage may not be injured; and, besides, the cutting or tearing of the soft tissues of the fœtus is a much easier matter than the severance of the skin, which is tough and difficult to cut, even before birth. The first incision through the skin should be made lengthways of the shank, and extend from the knee to the fetlock. The spatula is then introduced, and manipulated with the hand, so that the skin may be dissected from the limb progressively, as far as the withers on the outside, and the chest on the inside. At the back of the knee, the point of the elbow, and some other places, it may be necessary to use the knife to effect complete separation of the skin. As the dissection proceeds upwards, the first skin incision is extended on the outside of the limb right up to the withers. The limb is then disjointed at the pastern joint, and a cord attached above the fetlock, so that traction may be applied. Wherever resistance to the cord-pulling is offered, the flesh must be severed with the knife, when the skinned limb will pull away without difficulty.

The same method should be followed in the case of a hind limb, except that the hip joint will need to be dislocated with the knife.

When one or, at most, two limbs are removed, the rectification of the position of the fœtus and its delivery may oftentimes be rendered comparatively easy.

FIRING.

In human surgery, firing, or, to use a euphemism, "the application of the actual cautery," is considered to be a relic of the days of barbarism, but in veterinary practice the operation is still much in vogue, and has, for its justification, considerable success in the cure of many otherwise intractable lamenesses and limb lesions. An explanation of this difference between the practice of human and veterinary surgeons may be found in the fact that many of the conditions for which firing proves so successful in horses either occur but rarely or not at all in the list of human ailments. Of such conditions, the various inflammatory bone lesions of the limbs of horses—splints, ringbones, sidebones, and spavins—and the chronic sprains associated with curb, bowed tendon, and sprain of the suspensory ligament, may be mentioned as instances in which firing is successful above all other methods of treatment.

It is not intended to discuss the theories as to the therapeutical action of firing, but the opinion may be advanced that in most cases its curative action depends upon the increased local circulation and vascularity which it induces, whereby there is a hastening of the process of repair, whether of sprained tendon or injured periosteum. Certain it is that a ringbone or splint will "set" and a sprained tendon will "callous" after the application of the firing iron in less than half the time that the process would otherwise occupy.

Two methods of firing are mostly in use—viz., "line-firing" and "point-firing," or pyro-puncture. Line-firing is adopted for sprains of the back tendons, curb, ringbone, sidebone, spavin, &c., while point-firing is especially effective for splints. It is also sometimes more effective for spavins and sidebones, when the inflammatory action (ostitis) is deep seated.

In line-firing the instrument used is wedge-shaped, with a curved and moderately sharp edge 3 or 4 inches long. (See Fig. 6*a*.) The iron should have substance enough to maintain its heat for about five minutes. For pyro-puncture work the firing iron is pear-shaped, sufficiently pointed to puncture the skin and tissues, and having substance enough to hold heat. (See Fig. 6*b*.)

The part to be fired should be closely clipped, so that the hair will not flame. It is not usually necessary to throw the horse; more often by the application of a twitch to the nose, and holding up the opposite fore leg, or applying a side line to the opposite hind leg, the horse can be kept under sufficient control, and a much better job can usually be made when the horse is standing in natural position. The lines should be made regularly parallel to each other, not less than half an inch apart, and of even depth. The skin should never be cut by the iron, and crossing of the lines should be avoided, otherwise sloughing of pieces of skin is likely to occur.

In England it is customary to apply a blister after firing, but in Australia it is found that the practice often results in sloughing of large patches of skin, and consequent permanent blemish, so that it should never be followed. A little vaseline or hog's lard may be applied after the

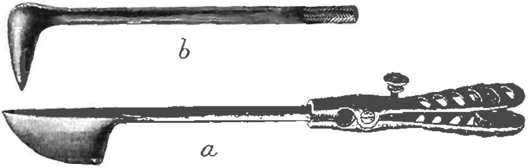


Fig. 6.—Instruments for (*a*) line firing, and (*b*) pyro-puncture.

lapse of a day or so, and the same precautions as are recommended to be adopted after blistering should be taken to prevent injury to the part operated on.

ARTIFICIAL IMPREGNATION.

This method of overcoming certain forms of barrenness in both mares and cows, and also of conserving the fecundating energy of male stud animals, has come into considerable vogue during recent years. Many instances of success in this method of breeding have occurred in Australia, and there is no reason why the practice should not be extended by capable veterinary experts in certain suitable cases. The operation itself is comparatively simple, but it is in the choice of suitable subjects for its application that expert knowledge is required.

To perform the operation, semen in secured, either by producing artificial ejaculation of the male, or by extracting it by means of a long flexible syringe from the vagina of a female immediately after copulation. The syringe should be warmed, and its contents kept at about blood heat before use. The same syringe is used for the injection of the female to be impregnated. It is inserted into the neck of the womb and emptied by pressing the bulb. The technique of both operations will be made clear by reference to Fig. 7, *a*, *b*, and *c*. Of course, it is necessary that the

female should be in an effective stage of "season." As many as half-a-dozen mares are stated to have been successfully impregnated with semen withdrawn from a mare after one service.

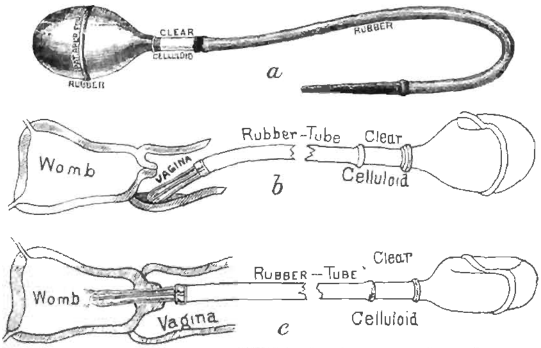


Fig. 7.—(*a*) Impregnation syringe. (*b*) Withdrawing fluid from vagina. (*c*) Injecting fluid into womb.

Neurotomy and Neurectomy (Unnerving).

Neurotomy is the operation of cutting a nerve, and Neurectomy the cutting out or removal of a portion of a nerve. Both operations are performed on horses for the purpose of depriving the part supplied by such nerve of sensation, and so relieving pain and consequent lameness. To this end neurotomy is the least effective, because the cut ends of the nerve frequently grow together, and sensation is renewed. Neurectomy is therefore most frequently performed. Its performance is almost solely confined to certain nerves of the fore limb, for the removal of persistent lameness associated with such diseases as ringbone, sidebone, and navicular disease. The usual seat of the operation is either above or below the fetlock, along the course of the plantar or digital nerves respectively. The former is known as high neurectomy, and the latter as low neurectomy. The median nerve above the knee and the anterior tibial nerve above the hock are also sometimes operated upon. (See Figs. 8 and 9.) Before describing the operation, it should be mentioned that in high neurectomy, if it is desired to completely remove the perception of pain in the region below, it is necessary to operate on both the internal and external plantar nerves, because of the fact that recurrent nerve filaments from the one nerve also serve the parts supplied by the other.

Anatomical knowledge of the course of the nerves is an essential to success in this operation. The reminder may be here given that the plantar nerve, as it passes downwards towards the fetlock joint, is accompanied by the artery and vein. The three lie side by side, the vein being in front, the artery in the middle, and the nerve most posteriorly. The word "van," being composed of the initial letters of the three structures,

furnishes a convenient aid to the memory as to the relative position of each. The nerve is immediately in front of the border of the perforans tendon, which should be taken as a guide in making the incision, about one inch above the fetlock.

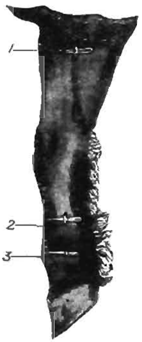


Fig. 8.—(1) Seat of neurectomy of median nerve. (2) Seat of high neurectomy, with plantar nerve exposed. (3) Seat of low neurectomy, with digital nerve exposed.

Fig. 9.—(1) Seat of neurectomy of anterior tibial nerve. (2) Plantar nerve of hind limb exposed at seat of high neurectomy. (3) Exposed tendon of peroneus muscle, sometimes operated on in spavin.

The horse requires to be thrown for the operation, and it is also advisable that he should be chloroformed, or, at all events, that local anæsthesia should be produced by the injection of cocaine. (See page 58.) To avoid excessive bleeding, a tourniquet or tight bandage should be applied above the knee, with special pressure along the course of the radial artery. The part to be operated on should have the hair clipped off, and be sponged with alcohol or other antiseptic.

After a vertical incision about an inch long is made, it may be necessary, especially in the case of underbred horses, to dissect away a little of the fascia, in order to cleanly expose the nerve. The nerve is then lifted with a pair of forceps, and a narrow blade introduced beneath——(see Figs. 8 and 9)—to separate it from the artery and deeper structures. The nerve is about the same thickness as the artery, and somewhat resembles it, but may be readily distinguished from it by the absence of pulsation and by its fibrated (longitudinal) structure. Having raised the nerve, it should be severed across at the upper end of the incision, and a piece from half an inch to an inch long dissected out and cut away. The wound may then be dressed with antiseptics, and a single suture inserted; and, the operation having been repeated on the other

side, a pledget of antiseptic cotton-wool should be applied, and supported in position with a clean bandage, and the horse let up. The bandage need not be removed for twenty-four or forty-eight hours, by which time, if the operation has been performed in a cleanly fashion, the wound will have commenced to heal, and will require little further attention.

Great care is always required in the shoeing of an "unnerved" horse, for, in case a "prick" or other injury to the foot is sustained, no pain will be felt, and therefore no warning lameness will be noticed until, perhaps, irreparable damage is done. It is one of the drawbacks to the operation that extensive inflammatory changes may occur in the foot without any noticeable sign being given. Cases have occurred in which the first indication of anything wrong has been the casting of the hoof.

Paracentesis (Tapping).

Paracentesis thoracis (tapping the chest) is an operation performed in cases of hydrothorax (dropsy of the chest) or empyema (pus in the chest)—for the removal of the contained fluid. The instrument used is either a trocar and canula or, preferably, an aspirating syringe. The skin is divided with a lancet, just in front of the fifth or sixth rib, and at a height sufficient to allow of the drainage of about one-half of the contained fluid. The skin should then be stretched to one side, and the trocar or syringe needle inserted in a direction slightly upwards, so as to facilitate the discharge of fluid. On removal of the trocar, the stretched skin is allowed to slip back, and so seal the deep opening made by the instrument.

Paracentesis abdominalis (tapping the belly) is an operation performed in a similar manner to the foregoing, but in the abdominal region, in cases of dropsy of the abdomen (acites).

Periosteotomy.

This operation will be described when the treatment of splints is being given.

Rumenotomy (Puncturing the Paunch).

This is an operation performed on cattle in cases of hoven, tympanitis, or flatulence of the first stomach (rumen or paunch). It is attended with very little risk, and needs to be done promptly when cattle are "blown" from over-feeding on clover, lucerne, or other excessively fermentable and gas-producing fodder. Preferably, the operation is performed with a trocar and canula—(see Fig. 10)—but in cases of emergency an ordinary clasp knife may be used instead of the trocar, and a large quill or piece of metal tubing inserted to take the place of the canula, and allow of the

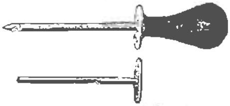


Fig. 10.—Trocar and Canula.

escape of gas. The puncture is made on the left side, at the most prominent part of the distension, which is usually a spot equi-distant between the last rib and the point of the hip. The instrument may be plunged directly through the skin and subjacent structures, but to do this considerable force needs to be exerted, and it is preferable to first make an incision about an inch long through the skin at the seat of puncture The canula

may be left in for a few hours if the formation of gas is continuing. On removal, a dab of tar over the wound is all the dressing necessary.

GASTROTOMY (ARTIFICIAL DISGORGEMENT OF THE STOMACH).

This operation involves the opening of the paunch and removal of portion of its contents. It is performed for the relief of impaction of the rumen, and the removal of rags, leather, nails, and other foreign bodies that have been swallowed.

The seat of the operation is the same as that for rumenotomy, but the primary incision should be made in an oblique direction downwards and forwards towards the border of the last rib. By cutting in this direction the superficial abdominal muscles are severed transversely, and the deep muscles longitudinally; the operation wound, when left to heal, is thus closed at the bottom, but gapes on the surface so allowing of the free exit of discharges. The incision through the skin should be from 6 to 10 inches long, according to the size of animal. On cutting through the muscles and wall of the rumen, it is advisable to stitch the edges of the wound in the rumen to the edges of the muscular wound by means of four or six stout sutures before proceeding further. This precaution is taken to prevent the wound in the rumen being moved out of position by the rolling of the rumen, and also to prevent any foreign matter passing into the peritoneal cavity. As a further precaution against the latter accident occurring while the removal of the contents is being effected, a small towel may be placed in position in the lower extremity of the wound. The hand and arm are then inserted, and the required amount of the contents of the rumen removed piece by piece. While this is being done, the edges of the wound should be kept apart by blunt hooks or the fingers of assistants. Medicaments may be introduced if desired.

The next step is the closure of the wounds. The temporary stitches are first removed; then the lips of the wound in the rumen are sutured with carbolized catgut, the edges being inverted, so that during healing any discharges and scab may fall into the rumen, and not into the peritoneal cavity. The wound in the deep abdominal muscles, which have been cut lengthways of the fibres, is then sutured; and, after dressing the external wound with antiseptics, an iodoformed cotton-wool plug may be inserted, and a stitch or two put in the external skin wound, leaving sufficient opening at the lower extremity to allow of the exit of discharges and the subsequent removal of the cotton-wool plug. Ordinary methods of wound-dressing will comprise the after-treatment.

SUTURING WOUNDS.

Sutures or stitches are employed to bring the edges of wounds together and maintain them in position during the healing process. Silk thread, catgut, twisted horsehair, kangaroo tendon, whipcord, and silver or pewter wire are used for suturing wounds. Catgut and kangaroo tendon are to be preferred as a rule, but metal wire sutures have the advantage that they may be tightened or loosened at will, and so be made to accommodate to any swelling that may occur. Silk thread, horsehair, and twine are apt to cut through the softened and inflamed tissues too readily. The thickness and strength of the material used should be judged according to the strain the sutures will have to support. All suture material should be soaked in antiseptic solution before use.

What is called the interrupted suture is mostly advocated for use in veterinary practice. Each stitch is tied by itself, so that, in the case of

one breaking or tearing out, the others still give independent support. For large flesh wounds, with heavy edges, the "quill" suture is recommended. Strong goose quills or rounded sticks of strong wood (lead pencils or wooden penholders do very well) are placed lengthways along the lips of the wound, about half-an-inch from the edges. They are fixed in a posi-

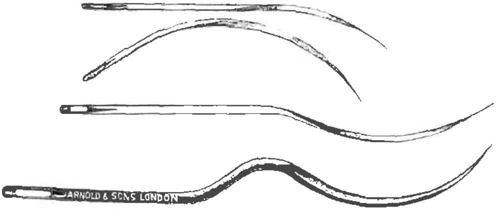


Fig. 11.—Various patterns of suture needles.

tion to support the wound edges by sutures passed through the wound, tied to the quills on each side, and drawn tight. The wound edges are thus supported, not only at the parts opposite the stitches, but along their whole length.

Tracheotomy.

Tracheotomy is the operation of opening the trachea or windpipe. It is generally performed for the relief of breathing in cases where there is obstruction to respiration, either temporary or permanent, in the larynx or upper part of the windpipe. The effect is often very successful in such affections as "Roaring," and many horses that would be otherwise useless are continuously worked with a tube fixed in the windpipe, through which both inspiration and expiration take place. The operation is also performed as a temporary expedient to prevent excessive straining during calving or foaling.

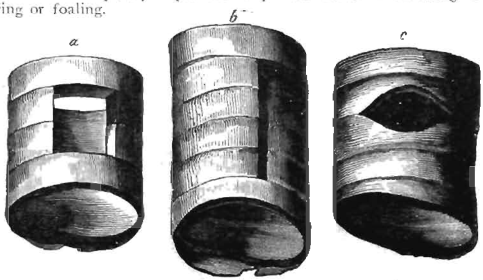


Fig 12.—Tracheotomy—Methods of opening the trachea.

The seat of the operation is usually the under surface of the neck, in the middle line. The upper third of the neck is chosen, because the

windpipe lies closest to the skin in that region. An incision about 3 inches long is made in the skin lengthways, cutting right down on to the rings of the windpipe. The opening may then be made by any of the following methods (see Fig. 12):—

(*a*) A square opening may be made by removing the parts of two contiguous rings; or

(*b*) A longitudinal incision through several rings may be made, sufficiently large to insert a tracheotomy tube:

(*c*) A semi-circular incision in any two contiguous rings, whereby a circular piece of the wall of the windpipe may be removed.

In both (*a*) and (*c*) methods care must be taken that the excised portion should not fall into the lumen of the windpipe. To avoid this, the part to be removed should be firmly grasped with forceps during the operation.

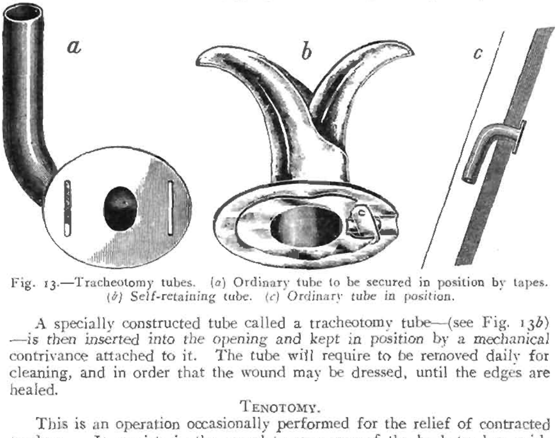


Fig. 13.—Tracheotomy tubes. (*a*) Ordinary tube to be secured in position by tapes. (*b*) Self-retaining tube. (*c*) Ordinary tube in position.

A specially constructed tube called a tracheotomy tube—(see Fig. 13*b*)—is then inserted into the opening and kept in position by a mechanical contrivance attached to it. The tube will require to be removed daily for cleaning, and in order that the wound may be dressed, until the edges are healed.

TENOTOMY.

This is an operation occasionally performed for the relief of contracted tendons. It consists in the complete severance of the back tendons midway between the fetlock and hock or knee, and results in their being lengthened. Many months are required for the severed tendons to become united by the interposition of false fibrous tissue. During this time the foot should be shod with a shoe extended or thickened at the toe, and lowered at the heels, so that the severed ends may be kept as far apart as possible.

TREPANNING OR TREPHINING.

This operation comprises the opening of hollow cavities in bones for the removal of foreign bodies or accumulations of diseased products, such as pus, parasites, or cysts. It is seldom performed elsewhere than on the skull or face. The opening is made with an instrument called a trephine—(see Fig. 14)—which is really a tubular saw having a central point fixed in the bone, by which the sawing or cutting edge of the tube is steadied.

A longitudinal or crucial incision is first made through the skin, sufficiently large to allow of the introduction of the trephine. The instrument is then worked round until a circular piece of bone is removed, when the foreign material may be extracted with forceps or syringed out.

The principal seats of operations are—(*a*) The cranial cavity, for the removal of the cyst of the *cænurus cerebralis* parasite in sheep, or of splinters of bone, or clots of blood, or accumulations of pus, on the brain surface; (*b*) the nasal cavity, for the removal of the maggots of the nasal fly (*œstrus ovis*), or of polypi; (*c*) the facial sinuses, for the removal of accumulations of pus which occur in nasal gleet, or for the purpose of molar tooth extraction by punching.

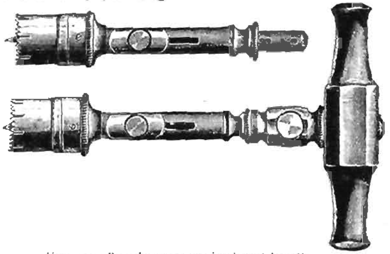


Fig. 14.—Trephines (two sizes) and handle.

The after treatment of the wound is not troublesome. A plate of bone tends to form very rapidly, and in many cases of nasal gleet difficulty is experienced in keeping the wound open sufficiently long to allow of the removal of the pus that is formed until the suppurating mucous membrane is brought into a normal condition by treatment.

II.—Methods and Practices.

BANDAGING AND MASSAGE.

Apart from the ordinary circumstances under which it is practised as a stable custom and method, bandaging plays an important part in the auxiliary treatment of many diseases of an inflammatory character. Woollen bandages are, for instance, very useful in maintaining equable circulation in the limbs, and so retarding internal congestions. Straw-rope bandages are also applied for the same purpose.

Facility in properly applying bandages can only be attained by practice, but the advice may be given that both edges of the bandage must always be kept taut, either by slanting the bandage to suit the inequalities of the limb, or by making a half-turn of the web. Most difficulty is experienced in bandaging joints capable of great flexion, such as the knee and hock, but if the above advice is adhered to, a firm and comparatively immovable bandage may be applied.

Just a word may be here said on the common practice of bandaging the legs of light horses. The application of a moderately tight bandage after work is an advantage, in that it assists in supporting the wearied joints and tissues at a time when they are temporarily played out, and so tends

to prevent filling of the legs, incipient windgalls, and other swellings. But they should not be kept on for more than an hour or two, unless the work has been inordinately excessive. By continuous bandaging, such as some racehorses are subjected to, the joints, tendons, ligaments, and tissues become so used to the artificial support that they lose their natural tone and strength, and bandaging comes to be a permanent requirement, instead of a temporary help, to the passing circulatory fatigue of the parts.

Hand-rubbing and Body Friction.

Closely akin to bandaging as a means of relieving leg weariness and preventing filling or "stocking" of the extremities, is the practice of hand-rubbing. It is a means of applying smart friction to a part so as to induce vigorous circulation, and to be of the most benefit must be carried on for half an hour or more.

Body friction by means of wisps of straw, brushes, or towels is a form of massage directed to the maintenance of evenness of circulation in the surface of the body in cases of colic and internal inflammations, where the tendency to "breaking out into a cold sweat" is observed

Blistering.

Blisters constitute a very frequent form of external treatment in animals, particularly in limb affections. In all cases they excite a determination of blood to the part, causing a surface inflammation; and are applied to uninflamed sprains and enlargements for the purpose of hastening the process of repair, or promoting absorption of an exudate. Other cases in which blisters are applied have been referred to throughout the text. The blisters in most common use are the "fly blister" or cantharides ointment, and "mercury blister" or biniodide of mercury ointment. These are made respectively as follows:—

Fly Blister.—Hog's lard or vaseline, 8 parts; powdered cantharides or Spanish fly, 1 part. Gently heat the lard or vaseline till melted. Then stir in the cantharides a little at a time till thoroughly incorporated, and allow to cool before use.

Mercury Blister.—Hog's lard or vaseline, 8 parts; biniodide of mercury, 1 part. Thoroughly mix the biniodide with the lard or vaseline by means of a spatula on a slab.

Any irritant medicament may be used as a blister, and powdered euphorbium, sulphuric acid, and such like are often added to "strengthen" the blister; but in Australia the use of these latter irritants is extremely dangerous, and often results in permanently blemishing the animal.

Blisters may be more effectively applied if the hair of the part is closely clipped. The severity of action of the blister largely depends on the vigor with which, and length of time, the ointment is rubbed in. As a rule, a smart rubbing with sufficient ointment to keep the skin and hands well lubricated for a period of five or ten minutes is sufficient to produce the desired effect. If the blister does not "rise" by the following day, bathing the blistered surface with hot water will expedite matters, or a little more of the ointment may be rubbed in. When a fly blister is used, the surface should not be extensive, as the active principle of the blister (cantharidine) is liable to become absorbed in sufficient quantity to produce inflammation of the kidneys; indeed, fatal results have at times followed on the blistering of all four limbs at one time. After the blister is applied, the horse should be tied up short, so that he may not be able to reach the part with his mouth when the itching commences. If he is to be turned out immediately, a "neck cradle" should

be worn for the same reason. After the lapse of a week or so, when the exudation has dried up, the blistered surface may be oiled or smeared with lard, to prevent cracking of the skin. When the action of the blister is too excessive, the part should be washed clean with luke-warm water, and a cooling liniment, such as equal parts of Goulard's extract and sweet oil, applied.

BACK RAKING.

This term is applied to the removal of the fœces or dung contained in those parts of the bowels which are reachable by the hand and arm. Back-raking is usually done as a preliminary to the giving of an enema in cases of colic, constipation, and other bowel complaints. The arm and hand introduced into the rectum should be well oiled, and no unnecessary violence used, so that subsequent straining and irritation may be avoided.

PASSING THE CATHETER.

A catheter is an instrument used for withdrawing urine from the bladder. Male catheters for the larger animals are made of flexible gum elastic, and are from 4 to 5 feet long, while those for females are about 18 inches. Passing the catheter in the horse and mare is a comparatively simple matter. In the former case, the horse having been secured, as elsewhere advised, and a twitch applied, the point of the penis is drawn gently out of the sheath with one hand, and the rounded end of the catheter inserted into the urethra with the other, the instrument, which should have been previously smeared with vaseline, being pushed as far as the bend of the urethra into the pelvis below the anus. An assistant should direct the point round this bend, and shortly afterwards the bladder will be reached, when the urine will commence to trickle away.

The urethral opening in the mare is on the floor of the vulva, about a finger's length from the lips, and is covered by a fold of mucous membrane, which requires to be lifted with the finger to allow of the passage of the catheter.

In the cow there is an obstacle to the free passage of the catheter in the shape of a small *cul-de-sac* at the entrance to the urethra on its lower side. The point of the catheter needs to be directed past this *cul-de-sac* with the finger, otherwise its introduction will be arrested.

In the bull and ram, the passing of the catheter is a somewhat difficult operation, in that there is a peculiar S-shaped curve of the urethra in the region of the scrotum, past which the catheter cannot be pushed while the penis is in a flaccid condition. It is, therefore, necessary to produce a partial erection, and withdrawal of the penis, so as to temporarily obliterate the curve before the catheter can be passed.

ENEMATA.

An ENEMA is an injection of fluid into the rectum or end gut. In cases of constipation, impaction of the colon, inflammation of the bowels, and diarrhœa, an enema is a valuable auxiliary to the general treatment.

Warm water, in which sufficient soap has been dissolved to form a copious froth, is usually used. It is injected by means of a force pump and hose (Reid's enema pump is specially designed for the purpose), or a large syringe or a large funnel with the tube at right angles to the bowl. (See Figs. 15 and 16.)

The quantity of fluid injected varies, but it is inadvisable that the rectum should be over-distended, as in that case the fluid will be quickly parted with. The most benefit accrues when the injection is held for a time. The fluid to be injected may be medicated with opium in cases of violent abdominal pain, or with anti-septics in cases of flatulent colic.

Fig. 15.—Funnel Enema.

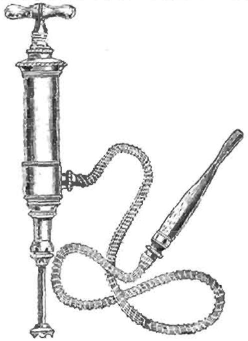


Fig. 16.—Pump Enema.

FOMENTING AND BATHING AND POULTICING.

FOMENTATION, in the strict sense, means the application of hot water to a part, but the term is also commonly used in reference to cold applications. Somewhat diverse opinions are held by practitioners as to the occasion on which hot or cold applications respectively are indicated. A good general rule to be guided by is that when pain is great, hot applications are best, inasmuch as by the swelling they tend to produce, the pain is relieved. On the other hand, cold applications are best for sprains and the like injuries, if the pain is not great, as they tend to retard swelling. Cold applications are also indicated in wounds, such as open joint, open tendon sheath, compound fracture, and the like, where liability to septic infection is great, or almost inevitable. They then act beneficially by retarding the multiplication of bacteria in the tissues. The so-called "drawing" action of poultices and hot applications is to a great extent due to the multiplication of bacteria under the favorable influence of warmth and consequent increased suppuration.

HOT FOMENTATIONS are applied to the feet and lower parts of the limbs by placing the foot or feet in a strong bucket or tub of warm water; to the limbs by means of flannel bandages; and to the chest, abdomen, loins, or other part by means of a blanket wrung out of hot water, and closely applied to the part. The heat in the latter case may be continuously replenished by pouring hot water gently on to the upper portion of the blanket from the spout of a teapot or kettle. As a rule, the application of hot water should be persisted in for one or two hours at a time, or until the pain or distress is obviously relieved, and on ceasing, the parts should be protected from a "chill" by covering or bandaging with

dry flannel or by the application of a mild stimulating liniment. The proper temperature of the water for hot fomentations may be best gauged by the hand. It should never be hotter than can be borne without pain or scalding when the hand is dipped in it.

COLD APPLICATIONS to the feet are best made by standing the animal in a foot bath. Where the limbs are concerned, the easiest method of application is by means of the hose, the end of which may be lightly bandaged in the position in which it is desired that the water should play. Cold applications should be continued for one or two hours at a stretch, two or three times a day, and the parts should always be rubbed dry and bandaged on ceasing. Ice, in the form of chunks or rough powder, may be bandaged in position, and serve to quickly reduce the heat in cases of severe sprain.

POULTICES are most frequently used in veterinary practice in foot cases—laminitis, pricked foot, corns, quittor, and inflammatory injuries. In addition to other more or less problematical benefits, they serve to soften the horn, thereby relieving pressure, and also rendering operations and "searching" of the foot much easier. Scalded bran applied hot is the most commonly used material, but linseed meal, boiled turnips, and hops have each their advocates: the latter substance has the advantage of being very light, and is, hence, useful in poulticing the udder, under-side of jaw, or other part where the poultice is likely to "sag" with its own weight. Cow dung, so frequently used by the ignorant as a poulticing material, because of its supposed possession of special "drawing" qualities, is an abomination, and frequently causes an otherwise healthy wound to become septic. Care should be taken that the poultice remains "sweet." If soured in the least, it should not be re-applied. To prevent souring, powdered charcoal is sometimes added to the poultice, and an addition of a little anti-septic solution, such as lysol or carbolic acid, to the water with which the poultice is being made, is a useful precaution.

SLINGING.

The use of slings for supporting horses when suffering from various injuries has been largely adopted in veterinary practice. The author's experience of their use, however, has been so adverse that it is not intended to suggest even that advocacy of them which would be implied in detailing the usual methods of slinging. Occasionally it may be advantageous to place slings under an animal that it is required to keep standing, so that he may "rest" in them, but, as a rule, by the systemic irritation they give rise to, their interference with respiration and digestion and other untoward results, such as bed-sores, which they produce, their use does more harm than good. At any rate, an animal should never be *suspended* in slings.

YELLOW-BREASTED ROBIN.

Eopsaltria Australis (Latham).

C. French, F.L.S., F.E.S., Government Entomologist.

This is without doubt one of our commonest robins, its home usually being in the heavily-timbered country near gullies, rivers, creeks, and also along the tea-tree scrub fringing the coast. As an insectivorous bird it

C. C. Brittlebank del. C. French direxit.

YELLOW-BREASTED ROBIN.

Eopsaltria australis, Latham.

has but few equals, not only destroying caterpillars, moths, butterflies and beetles, but also scale insects, which constitute its principal food. The following description is taken from Gould's *Birds of Australia*, vol. I., page 294:—

"The sexes are very similar in colour, but the female is somewhat smaller in size, and has the rump olive instead of yellow; the young, on leaving the nest, has the plumage streaked and spotted, very similar to that of other young robins, but obtains the plumage of the adult at an early period. Head and all the upper surface, wings and tail, with the exception of the rump, very dark grey; chin, white; all the under surface and rump, wax-yellow; irides, bill, and feet, black."

This robin is well known to visitors to the bush, and is a bird greatly admired on account of its tameness, often picking up crumbs a yard or two away whilst a person is having lunch under the shady fern and other trees. It is a very quiet bird, appearing almost unobserved, and remaining motionless for a few minutes, but should an insect fly past, it darts at it and returns to the bough to devour its prey. The nests are cup-shaped, and constructed of twigs, rootlets and bark—pieces of the outer bark are sometimes several inches in length. A fine specimen of the nest of this species is on view in the collection of insectivorous birds' nests at my office. The eggs are a deep, or sometimes light, olive green, with brownish-red markings; two or three usually constitute a clutch. Mr. J. A. Ross reports having seen one nest containing five eggs, and another with six eggs, at Fern Tree Gully, recently. The breeding season starts sometimes as early as July, but the principal months are October, November, and December. There are several broods each year. The eggs of the pallid cuckoo (*Cacomantis pallidus*) are often found in the nests of this robin.

I fully agree with Mr. A. J. Campbell, when speaking of this bird, when he says: "Of all our feathered forest friends, I know of none more attractive than the confiding and shapely yellow-breasted robin. Enter any quiet sylvan nook or deep gully for awhile, and there one of these birds will surely detect your presence, and, alighting in a pretty attitude on a twig, or clinging sideways to the bark of some tree-stem near, will watch your movements. Their lovely nests, too, are forest ornaments, and are extremely beautiful."

Unfortunately the nests, which are placed in bushes a few feet from the ground, are easily found by boys, with the result that many eggs and young birds are destroyed. Now that nature study is taught in our schools, and the value of protecting the useful birds of Victoria made known, it is hoped that the wholesale robbing and shooting of the birds will come to an end. A gun tax, especially on pea rifles, should be imposed, for boys with these weapons go forth on holidays, and shoot anything and everything that can fly. Not long ago, I came across a young man at Altona Bay, who had fully a dozen ground larks which he had shot with a pea rifle, and he coolly told me he wanted them for his dog. When I told him he was shooting valuable insect-eating birds, he began to see his mistake, and seemed grateful for my having enlightened him, and asked many questions concerning other birds, such as white-fronted Epthineura, delicate owl, fantails, &c., which are found plentifully on the grassy plains and in the large pine trees at Altona Bay. He said that in future he would leave these birds alone, and shoot the starlings instead.

THE ELEMENTS OF ANIMAL PHYSIOLOGY.

W. A. Osborne, M.B., D.Sc., Professor of Physiology and Histology, Dean of the Faculty of Agriculture in the University of Melbourne.

(Continued from page 720. Vol. iv.)

CHAPTER IV.

The Elements of Bio-Chemistry.

Of the many elements known to the chemist—some 77 in number—only twelve are essential for the maintenance of animal life. These are carbon, hydrogen, nitrogen, oxygen, chlorine, sulphur, phosphorus, sodium, potassium, iron, magnesium, and calcium.* All these elements are found in sea water or in soil, but the highly complex compounds which they form in bioplasm, and which are essential to life, are never found in nature except as products of life. Doubtless the chemist will one day be able to build up these complex and highly unstable bodies from their elements, but then only in successive stages, at considerable cost, and by the exercise of a highly-trained intelligence. Some of the simpler bodies, such as certain sugars, have been so built up, but the process is both tedious and costly. The chemical powers of living things are well exemplified in the case of nitrogen compounds. Nitrogen occurs free in the air, making up about four-fifths of its volume, but nitrogen compounds, produced apart from life, are present in air, earth, and water only in extremely small amounts. In every thunderstorm a small quantity of oxides of nitrogen is produced, but such oxides never occur in bioplasm. It is with carbon and hydrogen that the cell prefers nitrogen to be linked, and when we find such bodies anywhere on the earth, such as ammonia or sal-ammoniac, we may be sure that living things have been the cause of their formation. Plants have the power of taking up oxides of nitrogen by their roots and of changing the nature of the compound in their active cells, but such a source of combined nitrogen would never suffice for the needs of the many plants that grow on the earth's surface or in the sea. It is to certain bacteria that we must look for the performance of that most necessary task—the "fixing" of nitrogen; that is, the picking up of free nitrogen from the air and the formation from it of such compounds as can readily be used by plants. These nitrogen compounds are unstable bodies, so that if all life were destroyed on the earth, the combined nitrogen would tend in the course of time to become free.

The carbon which is found in bioplasm in the form of complex compounds was originally derived from the carbon dioxide which exists in the atmosphere to the extent of only some three and a half parts per ten thousand. If all life were to cease, these carbon compounds would rapidly break down and revert to the condition of carbon dioxide. As it is, this tendency is constantly in operation. How and where is it, then, that these complex carbon compounds have been built up so that life may be possible? For answer we must look to the vegetable kingdom, and particularly to

*To this list might be added iodine, which occurs in the thyroid gland, and fluorine, which is found in bone and tooth. The small quantities of silicon present in the animal body may be looked upon as an unavoidable, but harmless, impurity.

those plants which are exposed to light and have the exposed parts coloured (generally green). Starting from carbon dioxide and water, these plants can build up complex sugars and starches. But we have seen in a former chapter that it is from the break-down of such complex bodies that living things get their energy. How do the plants at once build up and break down? If breaking down gives off energy, then building up requires energy, and where do the plants obtain this? The answer is from sunlight. This process is taking place all around us wherever there is a green leaf or blade; light is being absorbed, and the energy in the light acting on the carbon dioxide and water is welding them together into the large molecules of sugar or the still larger molecules of starch. Then, from the breaking down of these into the two substances from which they were originally built, energy can be liberated by the plant in different parts of its structure, both to build up the simple nitrogen bodies absorbed by the roots, into the complex nitrogen compounds which we shall shortly study, and to maintain its other manifold activities, such as its upward growth and the raising of its sap.

With animals the case is different; they have no power of building up—they can only break down—and the complex substances which they require have all to be obtained from the vegetable world. Though animals are unquestionably on a higher plane of evolution, they are but poor chemists compared with plants. Plants can link the elements at their disposal, especially carbon, hydrogen, nitrogen, and oxygen, in many different ways, and produce an almost endless series of compounds. Animals, on the other hand, can do very little with the simpler bodies, and have to be content with the linkings which plants have produced. Some few chemical transformations they can bring about, but these are of a comparatively elementary nature. In fact, it pays the animal to get its complex bodies ready made, to be used in growth and in the repair of its bioplasm, and, by their break-down, to furnish the energy which it requires in a much higher degree than the plant. We thus see that animals are parasites on the vegetable world, for, even though some of them get their complex carbon and nitrogen compounds from the bodies of other animals, these, in their turn, live on vegetables or on other animals which do so. But the plant kingdom is not a complete loser by this parasitism, for every animal gives off carbon dioxide, and, therefore, adds to the store of this substance without which light, acting on the green leaf, could produce nothing; again, the excreta of animals, as well as their dead bodies, contain nitrogenous compounds which the plant can absorb by its roots and use in the manufacture of its bioplasm.

In dealing with the special chemistry of animals, it will be as well to include also certain compounds not found in the animal body, but present in the vegetable substances taken as food. The compounds to be studied will be considered under the following groups:—Water, metallic compounds, carbohydrates, fats and lipoid, proteins.

Water.

The importance of water will be at once admitted when we consider that it is the vehicle which brings nutriment to the tissues and carries waste matter from them; it is the chief ingredient of every cell, and is never completely absent from any part of the body. Deprivation of water kills quicker than stoppage of any other supply except oxygen.

The following table gives the percentage amount by weight of water in a number of tissues:—

	Per cent.		Per cent.
Enamel of tooth ...	0.2	Cartilage	54—74
Dentine of tooth ...	10	Muscles, glands, blood, and brain... ...	75—80
Fatty tissue ...	6—12		
Bone	14—40		

The percentage amount of water in the body as a whole is subject to continual variation; young animals have always a higher percentage than adults, and lean animals than fat. It is, however, safe to state that, on an average, two-thirds, or 66 per cent., of the weight of the animal body is water.

METALLIC COMPOUNDS.

Chlorides, carbonates and phosphates of sodium, potassium, magnesium, and calcium are found in animal bodies, and are absolutely essential to life.* It is a very suggestive fact that these salts are present in blood in much the same relative proportions as they occur in sea water. In fact, a mixture of one part sea water and three parts pure water, if pumped through the vessels of an organ (for instance, the heart or bowel) which has been removed from a living or recently killed animal, will maintain life in that organ for many hours. A somewhat diluted mixture can keep the heart of a tortoise alive and beating vigorously for some days. On the other hand, we find that any disturbance of the quantities of these salts in the blood (as regards either the total amount present or their mutual ratios), if not promptly rectified by the kidneys, will bring about serious derangements of every living cell in the body. As sodium chloride, or common salt, is the chief salt of the blood, we find animals instinctively endeavouring to keep up the supply; but too much of this substance will be injurious as well as too little, as is seen in the case of castaways who drink sea water. An animal fed exclusively on maize grains will soon be afflicted with muscular weakness and other troubles indicative of calcium starvation; the same often follows from exclusive oatmeal feeding.

How far these actions of salts are due to their combination with the nitrogenous ingredients of bioplasm, and how far to their electrical state, we do not at present know. This, however, is certain, that their presence in a fixed quantity and proportion is an absolute essential of life.

Another metallic compound which, unlike the foregoing, can hardly be called a metallic salt is the compound of iron which exists in the blood, and to which blood owes its red colour. Iron is so widely distributed in nature that a deficient supply in food must be of rare occurrence; it is, however, often stated that an adult mammal living exclusively on a milk diet suffers from iron starvation.

When the body of an animal or a portion of such is subjected to heat strong enough to burn all the carbon compounds present, the metallic compounds are left behind, and form what is called the ash. The composition of the ash varies with the portion of the body thus tested; for instance, bone ash is chiefly calcium phosphate, muscle ash is chiefly potassium phosphate, and blood ash is chiefly sodium chloride. The percentage amount of ash in the whole body will vary with different species of animals, and will vary even with individuals of the same species. Generally speaking

*Sulphates are also found to a slight extent in the blood, but they are probably waste products which the kidney is always endeavouring to remove.

the fatter the animal the lower is the ash content. Thus, the ash of an ox will vary from 6—4.4 per cent., a sheep from 4—3 per cent., and a pig from 3—2 per cent.

The following table gives an idea of the percentage amount by weight of ash in different parts of the animal body:—

	Per cent.		Per cent.
Hair and brain	... 0.5—0.7	Cartilage ...	... 1.5—2
Blood ...	... 0.6—1	Bone ...	... 6—7
Muscle ...	... 1—1.5	Enamel of tooth	... 96—98

CARBOHYDRATES.

Carbohydrates are compounds of carbon, hydrogen, and oxygen, the last two elements being present in the same proportion as in water—hence the name. All carbohydrates can be burned in the presence of oxygen, and when thus treated yield two end-products of combustion, namely, water and carbon dioxide. The absence of nitrogen is always to be borne in mind.

It is usual to classify the carbohydrates into the following groups:—

Simple sugars, or MONOSACCHARIDES.
Compound sugars with two sugar components, or DISACCHARIDES.
Compound sugars with three sugar components, or TRISACCHARIDES.
Carbohydrates compounded of a large number of sugar components, or POLYSACCHARIDES.

MONOSACCHARIDES.—These bodies are all soluble in water, are sweet to the taste, and can be prepared in the form of white crystals. They not only burn when heated in the presence of air, but also combine with oxygen when in solution. This property is strikingly shown in the following simple experiment:—If to a few drops of copper sulphate (bluestone) solution some strong caustic potash is added, the colour gets slightly deeper and a faint flocculent precipitate of copper hydrate is formed. Boiling produces no change, but if a little glucose solution is added whilst hot, a copious red precipitate forms, due to the sugar robbing the copper hydrate of some of its oxygen. A large number of monosaccharides is known to the chemist, but only a few of them have any physiological importance; these few can now be taken in series.

1. DEXTROSE, called also GLUCOSE or GRAPE SUGAR. It is present, as the third name implies, in the juice of the grape. It is also found in the blood, in honey, in various vegetable juices, and in the urine of diabetic animals. It is prepared on a large scale by boiling starch with weak sulphuric acid. Dextrose ferments readily with yeast, producing alcohol and carbon dioxide.

2. LEVULOSE, called also FRUCTOSE or FRUIT SUGAR. This sugar is found associated with dextrose, in honey and in many plant juices. It cannot be so readily crystallized as dextrose, and is much more difficult to prepare; in consequence it is a much more expensive article to purchase. Like dextrose, it ferments with yeast, producing alcohol and carbon dioxide.

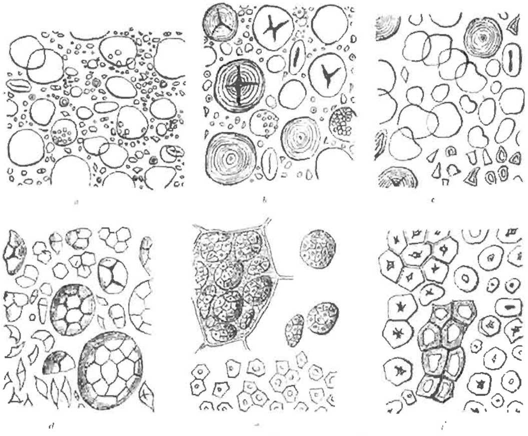
3. GALACTOSE, which is important on account of its relation to milk sugar, to be discussed later. With yeast it ferments either very slowly or not at all.

4. The PENTOSES.—This group comprises sugars which, though they are not found free in nature unless in exceptional circumstances, had better be mentioned here. They contain in their molecules less carbon, less hydrogen, and less oxygen than the three monosaccharides given above, and,

in fact, belong to a different chemical category. None of them ferment with yeast, and it is very doubtful whether they can be utilized to any great extent as food. In the human being, though they can be absorbed from the bowel, they pass through the body unchanged. ARABINOSE, prepared from gum arabic, and XYLOSE, prepared from wood, are the two pentoses best known.

DISACCHARIDES.—These compound sugars are, as has been stated, each composed of two simple sugars united chemically together. When boiled with acids they split up into their two components. Disaccharides are all white, crystalline, sweet to the taste, and soluble in water.

1. SACCHAROSE, called also CANE SUGAR or BEET SUGAR. This familiar sugar of commerce is found widely distributed in the vegetable world, as, for instance, in the nectar of flowers, in maize, in sorghum, but particularly



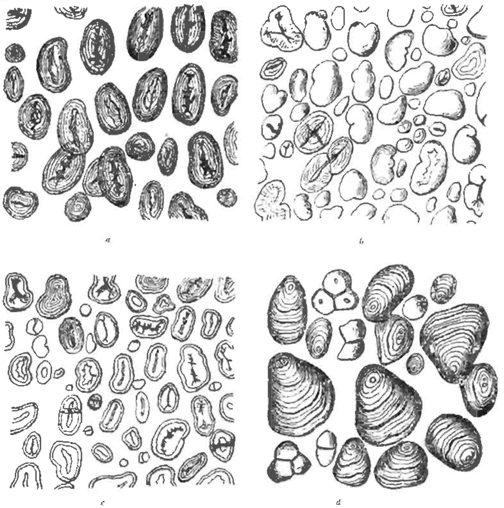
STARCH GRAINS (AFTER VOGL).

(*a*) Wheat. (*b*) Rye. (*c*) Barley. (*d*) Oats. (*e*) Rice. (*f*) Maize.

in the sugar cane and sugar beet. With yeast it ferments readily, but it does not give the copper sulphate test. When boiled with an acid it splits into its two components, namely, dextrose and levulose; this mixture is known as invert sugar, and is frequently used to adulterate honey which it closely resembles in chemical composition. Invert sugar gives, of course, the copper sulphate test as the two sugars, dextrose and levulose, are free and not combined chemically.

2. MALTOSE.—This disaccharide when boiled with an acid gives only dextrose, but it can be shown that each unit, or molecule, of maltose is composed of two dextrose units, or molecules, united together. It is found in germinating seeds, and thus is present in malt from which it derives its

name. The malt extract of commerce is chiefly composed of a maltose syrup. Maltose is a most important sugar from a bio-chemical stand-point, for into it all the starch of food must be changed by the action of digestive ferments before absorption by the bowel can take place. Maltose can be prepared in quantity by allowing seeds rich in starch to germinate or by subjecting starch itself to the action of the ferment diastase. Maltose, as is well known, ferments readily with yeast; it also gives the copper sulphate reaction.



STARCH GRAINS (AFTER VOGL).

(*a*) Bean. (*b*) Pea. (*c*) Lentil. (*d*) Potato.

3. LACTOSE, called also MILK SUGAR. This disaccharide, when boiled with an acid, splits into a mixture of dextrose and galactose. It gives the copper sulphate test, but ferments very slowly or not at all with ordinary yeast. It is not so sweet to the taste as the other disaccharides and is not so soluble. It is of importance in that it is the carbohydrate ingredient of milk, and is not produced anywhere in the animal kingdom except in the mammary gland (udder) of a mammal. It is readily attacked in solution by a bacillus (*bacillus lactis*) and transformed into lactic acid, a change which accounts for the souring of milk.

TRISACCHARIDES.—Only one trisaccharide is of importance, namely, RAFFINOSE, which is present in cotton seed, eucalyptus manna, and,

to a small extent, in barley and beet. When boiled with an acid it gives rise to a mixture of dextrose, levulose and galactose.

A number of compound sugars with more than three components is known, but as these are of little bio-chemical importance we may pass to the carbohydrates with many components.

POLYSACCHARIDES.—These carbohydrates are each compounded of a large number of sugar components, how large it is as yet impossible to say. The polysaccharides differ markedly from the sugars of which they are composed; they are not sweet to the taste, they do not ferment with yeast, they do not give the copper sulphate reaction, many are insoluble in water, and only a very few can be obtained crystalline. When boiled with an acid a polysaccharide breaks up into its sugar components, in some cases readily, in some cases with great difficulty.

1. STARCH.—Of the wide distribution of this carbohydrate in the vegetable kingdom and its importance in animal nutrition little need here be said. Starch occurs in nature in the form of microscopic grains which vary in size and shape according to the plant from which they are derived. It is insoluble in cold water, but soluble in hot, forming a paste which sets into a jelly on cooling. When treated with a solution of iodine it gives a rich blue colour, a reaction which can be used as an analytical test. When boiled with an acid it passes through a number of transition stages, including the dextrins and maltose, and is finally transformed into dextrose. When acted upon by the ferment diastase it passes through the dextrin stages, but ends as maltose, as has already been noted. Though important as an animal food, starch is not found anywhere in the animal body.

2. DEXTRINS.—These bodies represent steps in the splitting up of starch under the influence of acids or a ferment. They are all soluble in cold water, and give no colour with iodine, except the highest members of the series which give a chestnut tint.

3. GLYCOGEN, also called ANIMAL STARCH.—This polysaccharide rather resembles the higher dextrins than starch. It is soluble in water, and gives an intense chestnut brown colour on treatment with iodine. Diastase transforms it into maltose, but acids can carry it further, like starch and the dextrins, into dextrose. It is found in the liver and in muscle tissue and in many living cells. It functions as a store of fuel food on which the body can draw at need, just as starch, and to some extent the celluloses act as reserve material in the plant kingdom.

4. CELLULOSE.—This substance makes up the greater part of wood, vegetable fibre, and the walls of vegetable cells. It is familiar in the form of cotton wool and filtering paper. It is insoluble in water, cold or hot, and is acted upon by dilute acids only in a very slow manner. Strong acids transform it into dextrose. In alkaline solutions it swells up and becomes semi-transparent. The property of being insoluble in water renders cellulose eminently fitted for the purpose to which it is put in nature, namely, to build up the greater part of the framework of the walls of vegetable cells, of vegetable fibres and of wood.

Its insolubility, however, makes it extremely difficult of digestion in the animal bowel; in some mammals it passes through practically unchanged, in others a small percentage is dissolved by the combined action of bacteria and a special ferment.

The HEMICELLULOSES differ from true cellulose in that they are not so resistant to solvents, and can be digested a little more readily; moreover, they also differ in their chemical composition, for, whilst cellulose

proper yields only dextrose on treatment with acids, the hemicelluloses give rise to mixtures of various simple sugars. They are found in the outer covering of cereal seeds and in the reserve cellulose of plants.

The substance LIGNIN may be mentioned here. It is found in wood and in coarse woody fibre, and is a still more resistant substance than cellulose. Its chemical constitution has not been made out, and its chief physiological importance is that it passes through the animal bowel unchanged.

The cellulose group is quite unrepresented in mammalian tissues.

5. PENTOSANS.—These polysaccharides are compounded of pentoses, as treatment with an acid testifies. They are found chiefly in vegetable gums, but are also present in woody fibre. Pentosans are not found in the animal body, and their food value is very low.

FATS AND LIPOID.

Under the term fats we include not only ordinary animal fats but also the animal and vegetable oils, for these latter are simply fats that are liquid at ordinary temperatures. The term, however, does not include the mineral oils such as kerosene and paraffin oil, nor the "essential oils" of plants, which belong to totally different chemical groups and can neither act as foods nor take any part in forming the structures of the animal body. As common characters of fats which are well known we might mention that they are insoluble in water, and refuse to mix with it, and, as they are lighter weight for weight, they float on the surface of water. They boil at a temperature which is generally higher than the boiling-point of water, and they are readily inflammable.

Qualities not so generally known are the following: They are soluble in ether, chloroform and benzine. They are soluble in hot alcohol, but, as a rule, separate out in solid form on cooling. When liquid and when shaken with water containing even a small quantity of soap they break up into a multitude of droplets of microscopic size. These droplets, on account of their minuteness, rise to the surface so slowly that the fat may exist for a considerable time evenly distributed through the mixture—such a mixture being termed an *emulsion*. This formation of an emulsion in the presence of soap not only accounts for the detergent or cleansing action of this substance, but is, as we shall see, of the utmost importance in the digestion of fats.

Before we can understand the chemistry of fats mention must be made of the FATTY ACIDS. These acids contain carbon, hydrogen and oxygen, the carbon and hydrogen being greatly in excess of the oxygen. A large number are known to the chemist, and are classified in a regular series, the lower members of which (such as acetic acid) being liquid at ordinary temperatures and soluble in water, the higher members (such as stearic acid, present in certain candles and quite erroneously termed stearin) being solid at ordinary temperatures and insoluble in water. Between these extremes are intermediate forms, but the majority have solubilities like the fats; are, namely, insoluble in water but soluble in ether or hot alcohol. Many of the fatty acids possess a characteristic and often a very unpleasant smell.

Now, when a fatty acid forms a chemical compound with an *alkali* the result of the union is a *soap*; but when the fatty acid forms a chemical compound with *glycerine* the result is a *fat*. That fats are so compounded is shown by many facts and experiments. Fats, when subjected to the

action of superheated steam, break up into glycerine and fatty acids; the same decomposition can occur through the action of bacteria or of a special ferment found in the mammalian bowel. When fats are boiled with an alkali, glycerine is produced, whilst the fatty acid unites with the alkali to form a soap.

Of the many fatty acids known to the chemist only some five need be mentioned here—

Stearic acid	which is	solid	at ordinary	temperatures.
Palmitic acid	,,	solid	..	..
Oleic acid	,,	liquid	..	,,
Caproic acid	,,	liquid	..	,,
Butyric acid	,,	liquid	..	,,

Now—

Stearic acid	united to	glycerine	gives the fat	stearin
Palmitic acid ..	..	..	,,	palmitin
Oleic acid ..	..	..	,,	olein
Caproic acid ..	..	..	,,	caproin
Butyric acid ,,	,,	,,	,,	butyrin

Fats, as they occur in the body, contain always two or more of the fats above given, mixed together. Stearin and palmitin, when mixed, often go by the name of margarin, and the more of these two a fat contains the more solid will it be. On the other hand, olein, caproin and butyrin are liquids, and the larger the amount in which they are present the more fluid will be the fat. For instance, suet is chiefly composed of stearin and palmitin; olive oil contains olein as its chief ingredient, whilst milk fat or butter contains a considerable proportion of butyrin as well as some of the solid fats.

When a fat gets rancid what happens is that, through the agency of bacteria, the fat is split up into glycerine and fatty acid, the latter being readily detected by its odour—the smell of rancid butter, for instance, being due largely to butyric acid. In addition to this there is a slight oxidation of the liberated fatty acid and the consequent formation of other bodies which are not only odorous, but also harmful to the body when taken in food.

An interesting property of fats may be referred to here. When a liquid fat is shaken up with sodium carbonate it forms an emulsion exactly the same as if it had been shaken with soap. The reason for this is that in most fats there is always a small amount of free fatty acid which unites with the alkali in the sodium carbonate to form a soap, and it is this small amount of soap that conditions the emulsion.

LIPOID.—Lipoid is a substance found in the wall and in the protoplasm of every living animal cell, it forms the envelope of the red corpuscles of the blood, and also makes up the chief bulk of the myelin or insulating material of nerves. It possesses much the same solubilities as fats (soluble in ether, chloroform, and hot alcohol), but differs from them in this, that it can absorb water, and though not dissolving in the water, can mix with it. As a constituent of the cell wall, it carries out a most important function in controlling the permeability of the wall, allowing some bodies through more readily than others. Lipoid is composed of a variable mixture of at least two substances, LECITHIN and CHOLESTERIN. Lecithin is in reality a modified fat. Whilst fat contains carbon, hydrogen and oxygen, lecithin contains carbon, hydrogen, oxygen, nitrogen and phosphorus, and is in consequence often spoken of as a phosphorized fat. Lecithin can be

prepared in considerable quantity from volk of egg and from brain. Cholesterin.—With this body must be included the compounds it forms with fatty acids. Cholesterin can be prepared from brain, but the readiest source is wool-fat or lanoline. The compounds with fatty acids are much less readily broken up than fats, and, in consequence, do not become rancid so easily; hence the importance of lanoline as a basis for ointment, and hence the presence of cholesterin and its compounds in the natural ointment of most mammalian skins. Cholesterin is also found in the bile, and when, by any chance, it is no longer held in solution it forms a gall-stone or biliary calculus. Cholesterin is a compound of carbon, hydrogen and oxygen, but its exact chemical nature has not been fully made out.

THE COMMERCE ACT AND FRUIT EXPORTS.

J. G. Turner, Inspector under the Commerce Act.

The relation of the Regulations of the Commerce Act to fruit exports is, to some extent, misunderstood by many of those who intend shipping this season. This, no doubt, is due largely to the complex nature of the regulations, applying, as they do, to so many different goods. It is intended in this article to briefly set out the requirements of these regulations as applied to fresh fruits exported to London and other extra-Australasian ports.

Apples.—These may be put up in cases containing one bushel net. The case most suitable for this is the one set out in the recently-passed Fruit Cases Act of Victoria. By adopting this case shippers will save the trouble, time, and expense of weighing or counting the contents of each

Cleo. $2\frac{1}{2}$in.
APPLES.
JOHN SMITH,
VICTORIA,
AUSTRALIA.
—
1 bushel net.

case. The measurements given in the second schedule to the Act referred to are 18 x 14 x $8\frac{7}{8}$ inches (inside measurements). No divisions are allowed in such cases. A case of this size under the new law is deemed to contain 2237 cubic inches, and to have a capacity of not less than one Imperial bushel, so that exporters using cases of the standard size may safely mark them as containing "one bushel net." A smaller case, half the size of the one just described, is included in the schedule, but is not likely to be much used.

It may here be pointed out that although the Fruit Cases Act does not come into force until 1st July of this year, and therefore there is, at present, no necessity to comply with that Act, exporters must remember that the Commerce Act is now in actual operation. Thus the sizes set out in the Act of the future may be utilized for the benefit of growers shipping under the Act of the present.

Fruit intended for export must be marked "Apples" or "Pears" (or such description as the contents may warrant), together with the net weight or quantity; the word "Australia," the name of the State where grown, and the name of the exporter or his registered brand. It is recommended that the old-established practice of marking the variety of the fruit be adhered to. The size in inches should also be given as formerly. A case marked as above should look like that on the preceding page. The address of the grower may be included, if desired. The whole of the above brand must be marked on one end of the case, with the exception of the first line (variety and size of fruit) which is optional. The word "net" is also optional, but nevertheless the weight or quantity given must be net and no other. Port marks or consignees' brands may be affixed on any other part of the case—the other end preferably.

The use of a brand or initials is prohibited, unless such are registered. Application has to be made to the Comptroller-General of Customs for the registration of brands, and only brands which have been registered as trade marks under a State or Commonwealth Act are eligible for registration with the Comptroller-General. When making application, it is advisable to quote the number of the registration, so as to facilitate checking. It is urged that different brands should be placed on fruit consigned to different ports, or to or through different agents, otherwise mistakes are frequently made at the port of discharge in parcels reaching the wrong agents or consignees. Port marks or consignees' brands need not be registered.

Having packed and stamped the cases, in accordance with the above directions, it will be necessary to notify the examining officer as to the time and place of examination. This may be done by advice note, or by simply filling in and forwarding a Notice of Intention to Export (Form 2). This form applies more particularly to single shipments, but another form (Form 4) may be sent to cover shipments for the whole of the season in advance. Should this latter form be used, shippers must take care to notify the officer if any alterations are made as the season progresses. When making out these forms, the exporter will make a declaration as to the condition of the fruit as to soundness. (See Forms 2 and 4.) This declaration may be made before a Justice of the Peace, or before any Customs officer. The officer inspecting the fruit is a Customs officer, and a declaration given to him will suffice. Another form (Form 5), requesting the officer to certify and mark the goods with the Commonwealth stamp, must also be sent with the Notice of Intention; but if a shipper does not desire his fruit to be certified and stamped, this form is not required. Specimen copies of these forms are given at the end of this article.

With regard to this last instruction, it must be explained that when an exporter does not desire his fruit to be certified to or stamped, the fruit nevertheless must undergo the usual examination by the Government officials. All the other conditions must be also fulfilled, as previously explained, and in addition to this the cases must be marked so as to show the condition of the fruit as to soundness. This throws upon the

exporter additional responsibility with regard to the correctness of the description of his goods, and therefore it is urged that special care be given to the packing of none but sound fruit.

Pears.—The same regulations apply to these as to all other fruits intended for shipment under the Commerce Act. The cases used for pears are usually made up of trays cleated together. Under the Fruit Cases Act, pears must be exported in cases of the same size as for apples; but if sent in trays, each tray must show the weight or number of the contents; or the case (made up of trays as before described) may be marked "One Bushel." If packed in the Farrah-Thomas patent case, the number of fruits will be marked on the case. This case is suitable for nearly all fruits, and its use is sanctioned under the Fruit Cases Act.

The attention of exporters generally should be given to the penalties and forfeitures prescribed by the Commerce Act in regard to false trade descriptions, the omission to apply prescribed trade descriptions, and in respect to other infringements of the law.

Further details as to fruit export under the Commerce Act may be obtained from the Inspector of Fruit Exports, Government Cool Stores, Melbourne.

SPECIMEN COPIES OF FORMS.

FORM 2.

Commonwealth of Australia.

COMMERCE ACT AND REGULATIONS.

Notice of Intention to Export Goods other than Butter.

Doncaster,
23rd February, 1907.

To the examining officer at *Melbourne.*
Port of *Melbourne.*
State of *Victoria.*

Notice is hereby given that I intend to export the goods as set out hereunder.
The goods will be sent to the above-mentioned appointed place, and will arrive there at *9 a.m.* on the *26th of February*, 1907.

JOHN SMITH, Exporter.

Goods.	If in Packages.		If not in Packages.	Export Ship and Destination.	Date of Sailing.
	No. of Pkgs.	Size, Weight, or Measure, and Number of Contents.	Number.		
Apples	*100*	*1 bushel net.*	—	*Orontes, London.*	*26th February 1907.*

I declare the above-mentioned goods to be sound.

JOHN SMITH, Exporter.

(This part to be filled in by the officer.)
Goods examined, marked, and forwarded for shipment.

Examining Officer.

FORM 5.

Commonwealth of Australia.

COMMERCE ACT AND REGULATIONS.

Request to Classify, Certify, and Mark Goods with an Approved Stamp.

Doncaster,
23rd February, 1907.

To the examining officer at *Melbourne.*
Port of *Melbourne.*
State of *Victoria.*

I request that the good referred to in the accompanying notice of intention to export may be classified, certified, and marked with an approved stamp, in accordance with the Commerce Regulations 1906.

JOHN SMITH, Exporter.

(In respect to fruit the word "classified" should be struck out).

FORM 4.

Commonwealth of Australia.

COMMERCE ACT AND REGULATIONS.

General Notice of Intention to Export Goods other than Butter during a Stated Period.

Doncaster,
4th February, 1907.

To the examining officer at *Melbourne.*
Port of *Melbourne.*
State of *Victoria.*

Notice is hereby given that I intend to export goods in the quantities and manner as set out hereunder.

The goods will be sent to the above-mentioned appointed place for examination.

JOHN SMITH, Exporter.

Goods.	If in Packages.		If not in Packages.	Export Ship and Destination.	Date of Sailing.
	Number of Packages.	Size, Weight, or Measure, and Number of Contents.	Number.		
Apples ...	*100*	*1 bushel net*	—	*Orontes, London*	*26th Feb., 1907*
" ...	*200*	"	—	*Marmora, London*	*5th March, 1907*
" ...	*100*	"	—	*Ophir, London*	*26th March, 1907*

I declare the above-mentioned goods to be sound.

JOHN SMITH, Exporter.

THE NECESSITY FOR INSPECTION OF *some* DAIRIES.

The above are illustrations of milk dishes found in actual use by dairy supervisors when carrying out inspections under the Milk and Dairy Supervision Act. A glance at the plate will be sufficient to render it unnecessary to describe the unwholesome effect on the milk produced by the "rag-soldering."

A MILK-PRODUCING DISTRICT.

Report to the Chief Veterinary Officer, Dairy Supervision Branch, on Dairying in the Lilydale Shire.

J. S. McFadzean, Dairy Supervisor.

In the Shire of Lilydale, which covers an area, roughly speaking, of about 200 square miles, there are some 200 families handling an approximate total of 3,000 cows for the production of dairy produce, and the number of both is increasing yearly. There is an abundant supply of pure water from spring, creek, and river; a good annual rainfall; and the soil is naturally fertile over practically the whole district. The richness of the Yarra flats is well known; and most of the thickly timbered and scrub land of the hills, which is occasionally spoken of as worthless, has only to be cleared and well broken up, when a good first crop can be obtained without manuring. All through the rough country of the Shire there is evidence of this fertility. Almost every mile of bush country has clearings, where fruit trees, bush-fruits, crops of oats, peas, maize, potatoes, &c., are giving good returns; and, where the settlers have been any length of time in occupation, and the rotation of crops has resulted in a few acres of grass land being laid down, small herds of good conditioned milking cows are giving fair returns. The difference in the extent of the grazing areas on the flats, as compared with those of the hills, is accompanied by a variation in the class of stock used, and the branch of dairying followed by the residents of each part.

The Lowland Dairy Farms.

The large herds on the old-established pastures of the lowlands are mainly comprised of large framed stock, usually crosses of the Ayrshire and Shorthorn or Holstein, but there is also a fair number of pure stock of each breed, the Ayrshire largely predominating.

These farms are mostly engaged in supplying the metropolis with milk, for which business they are most favorably situated, being within 35 miles of the city, and having an early morning and evening train service. For about eight months of the year the cattle are fed at milking time with either ensilage, or steamed chaff, enriched with bran or molasses. The grazing is thus supplemented, and full use made of such milking qualities as the cows possess. The two last-mentioned food-stuffs are practically the only ones used in conjunction with chaff; very few use the molasses. Bran is looked on as the indispensable adjunct of chaff, and in a general way this is a correct view; but there are times, when an animal is in low condition, and with a plentiful supply of green grass available, that the bran diet acts rather in the nature of an aperient than a food. In such cases as this, some fattening food stuff, such as pollard, maize-meal, barley meal, or oil cake, might be used with advantage, as a substitute for or as a mixture with bran for a short period.

The milking sheds are on the whole well fitted, floored, and lighted; and are kept in good clean working order. The owners appear to strive to insure the sanitary handling of the milk from the cow to the consumer, and are usually fairly successful. One of the principal drawbacks to the attainment of this end is the difficulty at some seasons of obtaining reliable

milking hands. The casual or nomadic milker is not usually over-cleanly either in his milking methods or his personal habits, and the knowledge that his services nevertheless are in keen demand during good seasons renders him intolerant of suggestions in this regard; but, where the milking is done by families on the share system, or by members of the owner's family with only one or two hired hands, or where an employer has succeeded in getting together a few steady reliable men, the milking operations are conducted in a business-like manner. Apart from the frequent non-observance of the practice of washing dirty udders, one point where laxity is in many cases shown is in not straining the milk before passing it to the cooler vat. Milk should be strained directly from the milking bucket to the receiving can, and the strainer cleansed frequently; for, after unstrained milk has been repeatedly mixed up in a can by other bucketfuls being added to it, the dirt becomes broken to very fine particles, and subsequent straining will collect only grit and hair, and not the fine particles of filth held in suspension.

The milk is cooled on all these farms immediately after milking, and is forwarded straight away to its destination, except in the case of those farms which supply the Willsmere Certified Milk Company. This firm has recently erected a receiving depôt, with refrigerating plant, at the Yering railway station, on the Healesville line, the centre of this district, for the use of those shareholders of the company who are its milk suppliers. The milk received at this depôt after having been cooled on the farm to an average temperature of 60 degrees, is further reduced to 45 degrees or under, and then forwarded in cool trucks to the city twice daily; the morning's milk reaches Melbourne in the evening, and the evening's milk next morning. There is another similar plant on Mr. D. Syme's farm at Killara, on the Warburton line, from which milk is also forwarded to the same company.

This sale of new milk finds most favour with farms milking 50 head of cows and over, but, where the herds run much below that number, the separating of the milk on the farm, and forwarding the cream to the factory, is by far the most popular way of disposing of the produce, the skim milk being used for calf-raising or pig fattening on a small scale. Near the Lilydale township Mr. D. Mitchell's cheese factory at Cave Hill uses a good quantity of the milk from the neighbouring farms, in addition to that from the home herd of over 100 head. The bacon factory on the same farm is also a remunerative market for all dairy-fed pigs, and is the destination of practically every porker of this class for many miles round.

There are several silos of various sizes in the Shire. Their use has been attended with such success that each season sees an increase in their number, and they bid fair to become general before many years. Maize is the crop most generally grown for ensiling.

Between Lilydale and Yering there are a number of farms milking from 60 to 100 head. When more than 100 head are milked the herd is usually divided for convenience of handling. This allows of the cattle travelling more quietly to and from the sheds, and in each lot being a shorter time off the pasture. The extra labour the division of herds involves is, in this way, soon paid for. Probably before long some of the larger of these estates will be subdivided, and their carrying capacity should consequently increase, for, in addition to closer and therefore more effective management, the loss of energy involved in the walking of cattle

some two or three miles to and from the sheds twice daily means a corresponding lessening of milk yields. This decrease can be best avoided by having more sheds and more milking hands, which is usually only practicable in the economical sense where subdivision takes place.

UPLAND DAIRY FARMING.

Turning from the large farms of the lowlands to the smaller holdings of the hilly country, we find the Jersey, either pure or of a fair grade, is almost universal. Where a cross is used, it is Jersey-Ayrshire. The smaller areas compel the farmers to turn their attention to a greater extent to the class of animal that will produce most milk and butter for the quantity of food it consumes, and leave the raising of heavy vealers or beef to others more favorably situated. The Jersey, with its heavy and rich milking qualities, smallness of frame, and docility of temperament, has proved itself pre-eminently fitted for this purpose. These latter characteristics are no small items in this connexion; for, on account of the length and coldness of the winter, the milkers are housed at night for more than half the year.

Fruit growing is the principal business of the upland settlers; but one harvest a year, and that—owing to the increase of insect pests—a doubtful one, as against the weekly receipts from dairying, is resulting in a gradually growing extension of this latter branch of farming on many places. Timber being plentiful, a rough slab shed, with iron roof and slab floor, and brackenfern for bedding, has been the general class of housing accommodation up to the present. In most cases this flooring is being now replaced with brick or concrete, while others prefer the slabs, set in cement or tar to render it impervious to moisture, as being a warmer floor for the cattle to lie on. A method followed on one small farm to insure cleanliness in housing the cows may be mentioned. The stalls are fitted with both bails and head-chains. Finding that, with every care in bedding down, some cows always got dirty overnight, the plan was adopted of leaving all of them bailed up after feeding and milking till about 8.30 to 9 p.m., or about the time for feeding the stable horses. The stalls were then swept down, the head chains put on, and the cows released from the bails, when they almost immediately lay down on the cleaned floor, and arose clean in the morning. Still, whatever methods are employed, the cows are on the whole cleanly kept, and the dairying work is usually carried on under fairly clean conditions. The points where divergence from this rule is most marked are in the tendency to use the dairy as a general storeroom for household commodities and sundries, instead of for dairy produce only; and in the placing of the rest of the farm buildings, such as styes and stabling, in too close proximity to the dairy buildings for wholesome sanitary requirements. Another fault that has been general is to set aside one regular day, weekly, for making butter or forwarding cream to the factory, without taking into consideration the possibility of variation in the condition of the cream through atmospheric changes, and the consequent necessity of keeping it a lesser time to prevent over-ripeness. The result has been an untoward but inevitable variation in the quality of the produce.

Chaff, bran, and chopped green stuff, with occasionally ensilage, is the usual night ration for the milkers, which go out in the day time to pastures sheltered by the surrounding bush.

The majority of the farmers raise and fatten their own pigs, and many are the ideas expressed as to their housing accommodation, which varies all the way from a full complement of fresh air and ventilation in raised log styes, to close confinement in darkened sheds. However, as long as suitable food is given, and reasonable cleanliness observed, the pigs appear to fatten sufficiently fast in any class of stye which satisfies the ideas of individual owners.

The cattle in the hilly country are exceptionally sound, a blind quarter or any sign of disease being rarely met with. To some extent this may be accounted for by the stock being almost all locally raised, cows passing through sale-yards or dealers' hands seldom finding their way here.

As a rule, the settlers are fairly well posted in advanced methods of farming—manuring, draining, rotation of crops, pruning, spraying, &c., all current topics being intelligently discussed. There is further a considerable amount of good-fellowship towards each other displayed, in that, should accident or illness seriously interfere with any one's work, a day is appointed by the neighbours for a working-bee to repair the misfortune. It has been found that by these acts of friendship the workers themselves are in no way the losers, since the gatherings present splendid opportunities for the discussion of various subjects of mutual interest, and the knowledge gained therefrom more than repays the time spent in rendering such neighbourly assistance.

The Advantage of Recording Yields.

In considering the various phases of milk farming, as presented by a comparison of the herds of the district and their management, the one point that stands far out from all others is the disadvantage the herds labour under through not having the inferior milkers culled out. Every other item of management appears insignificant when compared with this often spoken of, and yet much neglected, matter. In this, as in every dairying centre, there are some farms where culling is regularly practised. In consequence, these farms show much increased returns per cow, but their number is lamentably small. A practical dairyman cannot afford to overlook the fact that, no matter how high-class their breeding, there are some cows that are not profitable to keep as milkers; and, only by the systematic checking of the results from each, can these be discovered. Occasionally may be met a man who mentally retains such a close knowledge of his stock and their individualities that he can give them in detail at a moment's notice. But very few men possess this gift; therefore, for the average farmer there is no more sure road to the improvement of his herd than by keeping complete written records of their individual milk production and their breeding. He must follow up the keeping of records by weeding out those cows shown to be inferior as milk producers, and must also rear for milking purposes only the calves from the best cows. The marking down of the milk yields of each cow on sheets, which may be procured for 6d. per dozen from the Department, or from any of the supervisors, does not take up much time, and the interest that is awakened in the doings of the herd, and the profitable and reliable knowledge that is gained is ample compensation.

In starting to breed or improve a milking herd, too many farmers think they have done all that is necessary if they have purchased a pure bred bull with a stud pedigree. This is certainly a step in the right direction, but there is more to be done. Purity of blood in a bull is of com-

paratively small value to the dairy farmer unless it is backed up by a record of the milk yield of his dam, and his sire's dam. A stud pedigree is usually evidence that at least some attention has been given to the characteristic points of that particular animal's breed in the mating of its progenitors, but, if there is added to this a record showing that, in connexion with these matings, the production of milk or butter has been given special consideration for even two generations previously, the animal concerned should be of highly increased value to the dairyman. The owner of such a bull cannot afford to mate him to unprofitable stock, hence a further necessity of knowing the capabilities of each cow in the herd to the end that, as the worst milkers are culled out, they can be replaced later on by heifers whose breeding is a fair criterion of what may be expected from them.

LESSONS FURNISHED BY GOOD FARMS.

Among the milk-farms of this Shire, those of Messrs. D. Syme, of Killara, R. Blair, of Mooroolbark, Whitley and Smith of Lilydale, and T. McIntyre, of Yering, are worthy of special mention, as their returns all demonstrate the attention that has been given to the improvement of their stock, as compared with those of other farms of the district; the appearance of the cattle on each place is as much to their credit as is their milk yield, they being of good even quality, and in good condition. Before going into figures, it should be mentioned that the averages are from early spring yields, when few of the cows were in full milk; still, as at that period the selling value of the milk was considerably in advance of what it is now, there would not be much variation in the cash returns. Individually these four farms stand with but a fractional difference between them; and together, from a total of 340 cows, they show an average daily production of 18¾ lbs. per cow. Looking down my list, the next highest individual score is 16¼ lbs., and, including this one, the next eight farms together show an average return of 15 lbs. from a total of 656 cows. Here is a difference of a full 3¾ lbs. per cow daily in favour of the culled herds. If this point is carefully looked into, it will be seen that a man with 80 cows, giving 18¾ lbs. daily, will get the same total milk return as one with 100 cows, averaging 15 lbs., showing very plainly that one cow in every five on these latter farms (or even, it may be said, on all the farms in the district, excepting those specified) is being kept at a dead loss. This actual cash loss in labour and feed can be worked out best by each farmer for himself. The difference in the value of the daily yield between the two classes of stock, when totalled up for twelve months, will represent a sum so large as to arrest attention and demand consideration and remedy. Comparing the herds indicated, it will be found that 3¾ lbs. extra daily from each of a herd of 80 cows makes an increase of 210 gallons per week, which, estimated at 5d. per gallon, amounts to a yearly sum of £227 10s., or a balance in favour of the culled herd of £2 16s. 10½d. per cow! Surely nothing can speak plainer than this in support of the necessity of every dairyman keeping a strict record of each cow's yield, and culling out the low yielders. It should be enough, at all events, to show that this work is one of the best paying items on the farm. When the benefits of the weeding out of poor stock are so apparent in connexion with large farms, how much more so must they be to owners of smaller farms, with more limited grazing areas, and to whom even one unprofitable cow on the place must be a very serious drawback. In a herd

of ten, one such cow means 10 per cent. loss on the yearly operations, and no farm can stand this. It is like paying a bank voluntarily 10 per cent. on the total capital invested in cows.

In the case of those who are engaged in the sale of butter or cream, the difference between each cow with regard to the quality of their milk has more particularly to be attended to, and when this can so easily and satisfactorily be done by the use of a Babcock milk-tester, at an outlay of less than 30s., it seems strange to find that farmers are so slow to take advantage of this little machine, which has done so much towards increasing dairymen's profits in every progressive dairying country. Some allow themselves to be deterred from the purchase of this testing apparatus through a groundless fear of its possible complications; but the fact is that any one with sense enough to run a separator will find no difficulty whatever in proving each cow's capability as a butter producer by this means. Among those farmers who are using the separator may be mentioned three who have succeeded in putting together herds of about twenty head that in both appearance and results are much superior to other herds of similar size in their districts, viz.:—Messrs. F. B. Lithgow, of Coldstream, R. Hill, of Lilydale, and G. Feidler, of Croydon. There are also occasionally met others with smaller lots of very nice stock that are a credit to their owners, and an object lesson to the neighbourhood.

PREVAILING CATTLE DISEASES.

Having been a cattle raising district for very many years, it is not to be expected that the Lilydale Shire has been altogether free from disease; tuberculosis, contagious abortion, and pleuro-pneumonia have each caused loss on some farms. It is claimed that owing to the Shire inspection and the perhaps harsh but effective practice that has been followed of summarily destroying all animals suspected of tuberculosis, this disease is less frequently met with.

Following on the advance of scientific knowledge of stock diseases and its distribution among those most interested, contagious abortion is getting to be better understood, and its chances of causing extended losses are being reduced. As regards the primary cause of outbreaks of this disease, it is significant that one farm that has suffered considerably in this respect is the one that is exceptionably noticeable for the rough driving of cattle to the shed, which matter the owner appears to treat as of little import.

Pleuro has broken out in this district intermittently throughout a period of over thirty years past. The most recent reappearance of the disease occurred about twelve months since, and it has not yet been completely controlled. During this period some fifty head of cattle have been destroyed on one farm, and some half-dozen head on each of two adjacent holdings. The mortality on the former might conceivably have been much less had more reasonable precautions been exercised. The disease was confined to the milking herd and its grazing area, and these animals alone were inoculated. Subsequently newly-calved cows were repeatedly brought into the herd without having been inoculated, and these invariably contracted the disease. When a new milking shed was erected on clean ground for the fresh cows the trouble ceased. On the two other farms every beast on the place was inoculated as soon as the disease showed itself, and it was thereby confined to those that had contracted it previously. By the quarantining of the affected paddocks and herds the Stock Department has so far succeeded in preventing the spread of the

disease beyond these three farms; but, considering the laxity displayed by the Shire in allowing cattle to wander on the adjoining roads, the restriction of the disease to these areas would appear to have behind it a strong element of luck.

Mammitis is a disease in connexion with which altogether too much risk is taken by owners here, notwithstanding the pointed information and emphatic warnings on this matter that have been recently published in the *Journal of Agriculture* under "Diseases of Farm Animals." Special mention is there made of the chances of loss which stock owners run through neglect of ordinary precautions in connexion with this and other diseases, yet very few farms have any provision for the keeping of affected or injured animals by themselves, or milking them separately. Even common humanity alone should be sufficient inducement to provide such accommodation, for any suffering animal is always horned about by the stronger and healthier members of the herd, and its recovery is thereby so much longer retarded.

GARDEN NOTES.

J. Cronin, Inspector Vegetation Diseases Acts.

The Canna.

Canna, the Indian Shot plant, is a family of herbaceous perennials, found native in Brazil and other parts of South America, and in Eastern Asia. Some of the species have been cultivated in English and European gardens as stove plants for a considerable time, *C. Indica* and *orientalis* flowering in England in 1570. About 1820 a number of species was introduced from Brazil and other countries of South America, but for some time little progress was made towards improving the canna as a florist's flower. Some of the species were stately foliage plants, but the flowers were small. Of late, florists, in France and Italy especially, have paid special attention to the canna, and have effected a marvellous change in the size and colour of the flowers. The hybrid varieties now produce spikes or bunches of beautiful flowers, a most decided contrast to the insignificant inflorescence of most of the species. The foliage in many kinds is large, and varying in colour from purplish red to bright green. There are, among the later introductions, two types, known as the "orchid-flowering" and the "gladioli-flowering" Cannas, that surpass, and are generally grown to the exclusion of other garden forms. The orchid-flowering varieties are taller in growth, and produce larger individual blooms than the gladioliflora type, but are more tender and easily affected by hot winds. They are specially suitable for pot culture, for greenhouse or verandah decoration. Some of the finest varieties bear highly coloured foliage, and are conspicuous plants in the garden, and worth cultivating for that alone. The gladioli-flowering type is of a much dwarfer habit of growth, and generally hardier. The flowers are more freely produced, and though smaller individually, are borne in larger

trusses. This type of canna is undoubtedly one of the finest classes of plants grown for mixed border decoration, producing bright flowers freely during the greater part of summer and autumn. In gardens in most parts of the State it thrives and blooms well, often under most unfavorable conditions. Canna blooms are not often used as cut flowers, the florets dropping too quickly, but last well on the plants, and after a hot wind has spoiled the blooms that are open, a fresh supply is produced in two or three days.

SOIL—SITUATION—CULTURE.

A cool friable loam is the most suitable soil for cannas, although the plants will thrive fairly in almost any kind of soil if well supplied with

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"AUSTRIA, CANARY YELLOW. ORCHID-FLOWERING TYPE.

manure and water. They are often grown in special beds that are protected by a fence or hedge from heavy winds but exposed to full sunshine, and in such positions, when well manured and watered, bloom freely for months. To get best results the soil should be deeply worked and well manured, half-rotted stable manure and bone dust being suitable fertilizers.

Cannas are specially suitable for planting in bold groups, or as specimens on lawns, in the mixed border, among rockwork, at edges of ponds, &c. Wind-swept and overshaded positions are unsuitable.

The *plants are propagated by dividing the roots or rhizomes.* A small piece of root, bearing two or three eyes or buds, is sufficient to produce a large plant during the season, if well provided with nourishment. The best and strongest eyes are produced at the extremities of the rhizome. The plants may be divided in August or September, and the divisions

planted into their flowering quarters immediately, or they may be potted to plant out later. Where the plants must be grown continuously in one plot of ground, the best plan to adopt is to lift the plants after they are cut down by frost in winter, and plant them temporarily in some other place —under trees or any corner will suffice—but they must not be allowed to become dry and wilted. New soil and manure can then be deeply worked into the bed, and divisions of the plants set out in spring. Pieces of root should be planted about two inches beneath the surface. Subsequent cul-

"FLORENCE VAUGHAN": ORANGE YELLOW, SPOTTED SCARLET. GLADIOLI-FLOWERING TYPE.

tivation is, principally, supplying and maintaining moisture in the soil. Where water is scarce, a heavy mulch of stable manure should be applied early in the season, and the plants liberally watered during hot dry weather. Stems that have flowered should be regularly cut away.

VARIETIES WORTHY OF CULTURE.

Orchid flowering (mostly of tall habit of growth):—*Italia, Austria, Alemannia, Africa, America, Bavaria, H. Wendland, Pandora, Suevia, Cuba, Heinrich Seidel, Mont Blanc.*

Gladioli flowering and other types:—Florence Vaughan, Madame Crozy, Papa, Paul Lorenz, Edouard Andre, Alice Guilfoyle, Queen (Konigin) Charlotte, Emilie Lorenz, Souvenir de Antoine Crozy, Souvenir de President Carnot, L. E. Bally, Doyen Jean Libaud.

Flower Garden.

Dahlias, chrysanthemums, and other plants that bloom during autumn will require special attention during February, if the best results are desired. Dahlias planted about end of December will begin to bloom about end of March if unchecked in their growth. The growths will need to be thinned if exhibition blooms are desired, about eight shoots being enough to leave. These should be securely tied to stakes as growth advances. When the buds appear, they also need thinning, and may be "timed" to produce the blooms at intervals by selection of buds of varying size. The largest bloom is generally developed from the central bud of the shoot, but there is nothing like the need of saving "crown" buds on the dahlia as there is on chrysanthemums. In the latter case, if the crown bud is lost, all hope of the shoot producing a first-class flower is gone; but the dahlia will produce good flowers from almost any bud when well-grown. Where the plants are not growing satisfactorily, although watered, a solution of nitrate of soda, or sulphate of ammonia, used at rate of 1 oz. to 6 gallons of water, will probably be of benefit. The plants must be forced to grow freely this month to produce good flowers in season.

Chrysanthemums grown for large blooms produce their late crown buds this month. These must be "saved" as soon as the shoots surrounding the buds can be safely removed. The flower bud is placed in the centre of the point of the shoot, and is easily distinguished from the growth buds. A brighter-coloured and more refined bloom is developed on the second crown bud than on those produced earlier. The larvæ of a number of small moths attack the buds in most places. A rolled leaf is an indication of their presence, and they should be carefully sought for and destroyed. A light dressing of some complete manure may be applied and lightly worked between the plants about the end of the month. Peruvian guano is one of the best manures for the purpose.

Roses may be pruned lightly and started into free growth by application of water. The plants, when so treated during February, produce good blooms early in autumn, and if supplied with some liquid manure, or quick-acting artificial manure, will often give more satisfaction than in spring. This is particularly the case with plants of the tea and hybrid tea sections. In summer pruning of roses, the plants should not be beheaded as in winter, a thinning of the weakly and very soft shoots and light topping of the remainder being all that is necessary. As much foliage as possible should be saved; and where mildew and aphis are usually found to attack the plants, a spraying with liver of sulphur or "nikoteen" should be applied on the first appearance of either. Dusting with flowers of sulphur is a substitute for spraying with liver of sulphur (sulphide of potassium) against mildew.

Carnation layers should be kept moist. Strong young plants will thus be available for planting early in autumn, and will become well established before the ground becomes cold in winter. Fine flowers may be expected from such plants in spring.

A number of spring and autumn flowering bulbous plants may be planted, including Amaryllis, Brunsvigia, Nerine, Ixia, Narcissi, and many others.

Ground should be prepared for the reception of seeds of hardy annuals. These may be sown in beds or boxes, the young plants being afterwards transplanted into their flowering quarters.

Kitchen Garden.

Growing crops will require as much water and cultivation as possible. Free, unchecked growth is necessary, or the produce will be tough and poor in quality. Where water is scarce, only a limited quantity of hardy vegetables should be grown, and these should be well cared for.

Ground should be prepared for receiving crops that will mature in winter and spring. After any crop is gathered or cut, the soil should be deeply dug and well manured, even if cropping is not immediately intended. The soil will be in good growing condition when required, and the fertilizing properties in the manure conserved. Seed of cabbage and cauliflower may be sown in beds for transplanting. In preparing beds for such seeds the soil should be finely worked and well enriched. Seed should not be sown broadcast on dry soil. The beds should be firmly rolled and pressed, and watered prior to sowing. The seed should be covered with light soil to a depth of about half-an-inch, and lightly mulched with horse droppings. Should aphis attack the young plants in the seed beds, they should be sprayed with a solution of fir-tree oil. No old plants that are liable to be affected by cabbage aphis should be allowed to remain in the proximity of the beds.

Succession sowings may be made for peas, beans, and saladings, and transplantings made from former sowings.

THE PROCLAIMED PLANTS OF VICTORIA.

(*Continued from page* 28.)

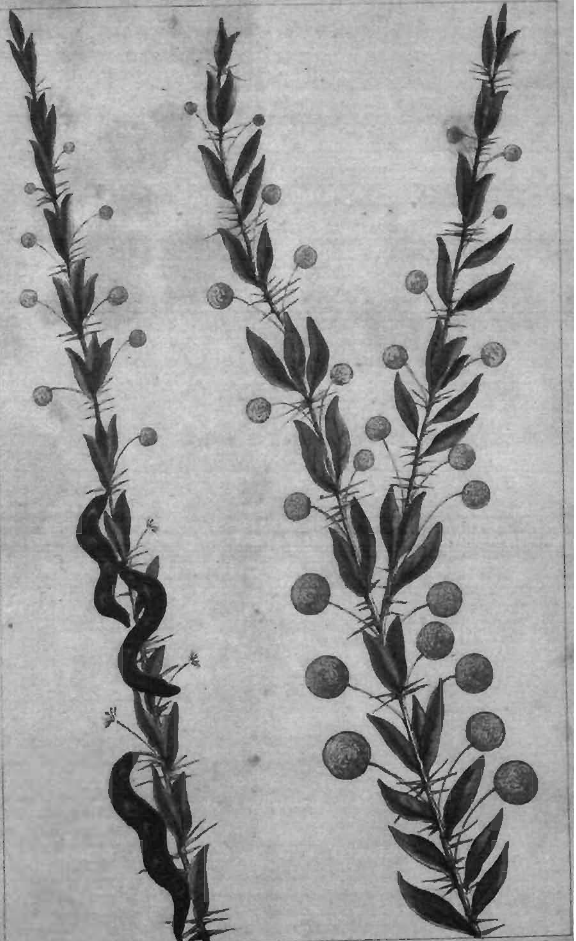
Alfred J. Ewart, D.Sc., Ph.D., F.L.S., Government Botanist; and J. R. Tovey, Herbarium Assistant.

Acacia-hedge.

Acacia armata, R. Brown. (*Leguminosa*).

A bushy shrub, with angular, striate (grooved) branches. The flattened leaf stalks resemble leaves (phyllodes), and are semi-ovate, oblong, often wavy, with a central midrib, about 1 inch long. Stipules spiny, 4 to 5 lines long. Flower-stalks as long as the phyllodes, bearing globular heads. Pod 1½ to 2 inches long, 2 or 3 lines broad. Seeds oblong, the funicle forming three or four folds. Indigenous to Australia. This well-known hedge-plant varies considerably, sometimes attaining to a height of 10 feet or more, and, being perennial, is difficult to eradicate; it should be dug up before flowering. Proclaimed for the shires of Dundas, Frankston and Hastings, Hamilton, and Portland.

PLATE 9



ACACIA HEDGE

(*Acacia armata*, Rob Brown.)

ROBBING BOX HIVES.

R. Beuhne, President, Victorian Apiarists' Association.

The usual way of robbing box hives is to turn the hive open-side up, stand an empty box of the same size on top, and drive the bees up into the empty box by beating the sides of the full one with sticks continuously for five or ten minutes. This causes the bees to run up into the empty box, which is then placed on the stand formerly occupied by the hive.

The combs can then be cut out of the full hive, brushing off any bees which may be left between the combs on to the entrance of the new box, so that they may join the others.

The brood contained in some of the combs is, of course, wasted, and this is the principal objection to this style of hive. To avoid this destruction of brood, in other words, of the whole succeeding generation of bees, some box-hive bee-keepers adopt a system of tiering up, similar to what is practised with bar-frame hives.

The method is to bore a number of holes into the top of the box occupied by the bees, three or four at each corner, with a 1-inch centre-bit, and place an empty box of the same dimensions on the top. When the lower box is full, the bees go up, and, if the season be good, fill the empty one usually with all clean honey, which may be removed at the end of the season without any detriment to the bees below.

Another way is to prepare a box (of similar size to the hive) by removing the top, and making slats 1 inch wide and ¼ inch apart, in place of it, thus giving a slotted top. When the box-hive is nearly full, the empty box is placed on the stand, with an entrance where the former entrance was; the full box is then placed on top, and its entrance closed. The bees enter their hive through the new box, and, as comb-building proceeds, work down through the slatted division into the lower box. As bees always store the honey above the brood, the queen laying eggs into the new comb as it extends downwards, the whole, or nearly the whole, of the broodnest is after a while forced down into the lower box, and the upper one is filled with honey. To take the honey, separate the two boxes by means of a thin wire passed through with a sawing motion, raise it, say, half-an-inch, and leave it for 20 minutes to allow the bees to clean up, and then remove the honey. Drive out into an empty box, as stated at the commencement, and place the bees back on top of lower box. The upper box may be removed after the bees have joined in the lower box, and if no more honey is expected that season, a board cover placed over the slats. The lower box may have an empty one again placed on the top in the following season.

If getting an immediate supply of honey is the object in view, there is no other way than the direct robbing method first described.

THE ARTIFICIAL MANURES ACTS.

UNIT VALUES FOR THE YEAR 1907.

W. Percy Wilkinson, Government Analyst for Victoria, and Acting Chemist for Agriculture.

The requirements of the Victorian Artificial Manures Acts are as follow in regard to the analysis of samples of manures each year :—

"In the case of manures which are not liable to vary in quality during the current season every vendor of or dealer in manures, who is required by the Minister so to do and manufacturer or importer of manures shall every year in the month of October or November and also whenever required by the Minister so to do deliver to the said chemist without payment samples not exceeding two pounds in weight of the manures which he intends to offer for sale or which he will use in making any special mixture required and which are not liable to vary in quality during the current season."

"The said vendor manufacturer importer or dealer shall forward with such samples a statutory declaration in such form as may be prescribed to the effect that the samples delivered are correct samples of all the manures to which this section applies which he will offer for sale or sell during the current season and declaring the prices at which he will either himself or through his agents sell such manures to persons who require the same for purposes of cultivation but he may vary any such price after giving notice of such variation to the said chemist."

"The said chemist shall analyze or cause to be analyzed under his supervision all samples forwarded to him pursuant to this Act by vendors manufacturers or importers of or dealers in manures, and taking into account the constituents which have a commercial value in each sample, shall calculate from the results of the analysis the average unit value of such constituents, and shall then compile a complete list of all the manures offered for sale showing the prices asked for the same and showing also their value according to the average unit values as calculated from the analyses."

"Such average unit values shall constitute the basis for calculating the values of all manures for twelve months from the publication of such list pursuant to the provisions of the Artificial Manures Acts."

The samples of manures forwarded to the Chemist for Agriculture for analysis and valuation for the 1907 season numbered 109. The analyses of the whole of these samples of manures, their selling prices, and their calculated values are shown in the tabulated list on pages 111-116.

UNIT VALUES OF MANURES IN THE MELBOURNE MARKET FOR THE 1907 SEASON.

	Unit Value. s.	d.
1 per cent. of nitrogen in the form of nitrate of soda ...	15	0
,, ,, ,, ,, nitrate of potash ...	15	6
,, ,, ,, ,, sulphate of ammonia	14	4
,, ,, ,, ,, blood manure ...	11	0
,, ,, ,, ,, fine bonedust ...	11	0
,, ,, ,, ,, coarse bonedust ...	9	6

If an invoice does not state whether the nitrogen in the manure is in the form of nitrate, or sulphate, or blood, or bones, it is to be assumed to have the value of bone nitrogen.

	Unit Value. s.	d.
1 per cent. of water soluble phosphoric acid	4	6
1 per cent. of citric soluble phosphoric acid (Thomas phosphates, nitro-superphosphates, ordinary superphosphates, guanos)	4	0
1 per cent. of insoluble phosphoric acid (Thomas phosphates, nitro-superphosphates, guanos) ...	3	0
1 per cent. of insoluble phosphoric acid, in ordinary superphosphates	1	0
In a bone-dust—		
1 per cent. of phosphoric acid in fine bone	4	0
,, ,, ,, ,, coarse bone ...	3	0
,, ,, potash	5	6

The average commercial value per ton of a manure sold in Victoria is obtained by multiplying the percentages stated of the fertilizing substances by the corresponding unit values fixed therefor, and adding the separate values together. Examples:—

1. Sulphate of ammonia. Invoice certificate. 18 per cent. nitrogen—

	£	s.	d.
Calculation: 18 x 14s. 4d.	£12	18	0
Calculated value per ton	12	18	0

2. Superphosphate—

Invoice certificate 20 per cent. phosphoric acid (water soluble).
,, ,, $2\frac{1}{2}$,, ,, ,, (citrate soluble).
,, ,, $1\frac{1}{2}$,, ,, ,, (insoluble).

Calculation—

	£	s.	d.
Phosphoric acid (water soluble), 20 x 4s. 6d.	£4	10	0
,, ,, (citrate soluble), $2\frac{1}{2}$ x 4s.	0	10	0
,, ,, (insoluble), $1\frac{1}{2}$ x 1s. ...	0	1	6
Calculated value per ton ...	£5	1	6

3. Bonedust—

Invoice certificate, 5 per cent. nitrogen, 20 per cent. phosphoric acid.

Mechanical condition: 30 per cent fine, 70 per cent. coarse.

Calculation—			£	s.	d.
Nitrogen—Fine	$\frac{5 \times 30}{100}$	= 1.5 x 11s.	= 0	16	6
Coarse	$\frac{5 \times 70}{100}$	= 3.5 x 9s. 6d.	= 1	13	3
Phosphoric acid—Fine	$\frac{20 \times 30}{100}$	= 6 x 4s.	= 1	4	0
Coarse	$\frac{20 \times 70}{100}$	= 14 x 3s.	= 2	2	0
Calculated value per ton ...	...	...	... £5	15	9

It is of interest to compare the unit values for fertilizing substances in the various States of Australasia. The table below, prepared by the Australasian Association of official Agricultural Chemists (1906 conference), shows that the values are, on the average, practically in favour of Victoria, while in the case of superphosphate the table indicates that Victorian agriculturists possess a decided advantage over those of the other States and New Zealand. In New Zealand a ton of superphosphate guaranteed to contain 20 per cent. water soluble phosphoric acid, and 1½ per cent. insoluble would be valued at £6 5s. 3d., as against a value of £4 11s. 6d. in Victoria. The same manure would be valued at £5 3s. 10½d. in New South Wales.

TABLE I.

COMPARATIVE UNIT VALUES FOR MANURES OF AUSTRALASIA, 1906.

—	Nitrogen.			Phosphoric Acid.					Potash as—	
	Nitric.	Ammonia Salts.	Organic.	Water Soluble.	Citrate Soluble.	Insol. in Fine Bone.	Insol. in Super.	Total in Slag.	Sulphate.	Muriate.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Tasmania ...	15 0	15 0	12 0	5 6	4 6	3 3	2 6	...	5 6	...
New Zealand ...	17 0	17 0	13 0	6 0	...	3 6	3 6	3 0	5 0	...
Queensland ...	17 0	15 0	14 6	5 6	4 0	3 0	...	...	5 6	5 0
West Australia	17 0	17 0	14 3	5 2	3 10	3 0	2 7	...	6 0	6 0
New South Wales	15 7	13 9	13 8	5 0	...	2 10	2 7	...	5 2	4 5
Victoria ...	15 6	14 4	11 0	4 6	4 0	4 0	1 0	3 0 Insol. P_2O_5	5 6	...

The values fixed for fertilizing substances in the United States (Massachusetts, Connecticut, Rhode Island, Maine, Vermont, and New Jersey Stations Conference)* are given below Table II. They are instructive, and indicate that the agriculturists of Victoria are quite as well supplied with phosphatic manures in regard to trade prices, as the agriculturists of the above American States. For nitrogenous manures, the American value is much higher than in Victoria. In California, as shown in Table II., the cost of manures of almost all classes is higher than in Victoria, the cost of nitrogenous fertilizers being half as much again as in this State.

* Bulletin No 111, Hatch Experiment Station of the Massachusetts Agricultural College, July, 1906.

TABLE II.

UNIT VALUES OF FERTILIZING INGREDIENTS IN MANURES FOR CALIFORNIA AND MASSACHUSETTS, CONNECTICUT, RHODE ISLAND, MAINE, VERMONT, AND NEW JERSEY STATIONS.

	California unit Values, 1906.		Other States mentioned above as adopted by Conference, 1906.		Victoria unit Values, 1906.	
	s.	*d.*	*s.*	*d.*	*s.*	*d.*
PHOSPHORIC ACID.						
Water soluble	5	7	4	3	4	6
Citrate soluble	5	7	3	9	4	0
Citrate insoluble	...		1	10½	1	0
In fine bone and tankage	4	2	3	9	4	0
In coarse bone fish and tankage	3	3	2	10	3	0
Insoluble in mixed fertilizers	2	4	1	10½	3	0
NITROGEN.						
Inorganic.						
In ammonia salts	16	0	16	4	14	4
In nitrates	15	5	15	5	15	6
Organic.						
In dry and fine ground fish, meat, and blood	17	3	17	3	11	0
Mixed fertilizers	16	0	17	3		
Fine bone and tankage	16	9	16	9	11	0
Coarse fish bone and tankage	13	0	12	1	9	6
POTASH.						
As Sulphate ...	5	7	4	8	5	6
As Chloride	4	8	3	11	5	6

The practical utility of the unit value system is that it enables a farmer to readily ascertain if the price asked for a manure is its reasonable commercial value. The term used the "commercial value" must not be confused with the "agricultural value" of a manure. They are quite distinct. The commercial value represents the value of a manure according to its composition. The agricultural value of a manure is measured by the extent of the increase in quantity and quality produced by it in a particular crop grown in a particular soil, under certain conditions. The agricultural value of a manure may vary quite extensively. A particular soil, for instance, may not give an increased crop return after application of nitrogenous manures commensurate with the cost of the fertilizer. On another soil an application of superphosphate may not increase the yield. In both instances the manures would have no positive agricultural value. A practical illustration of this point is afforded by the effects of ordinary applications of nitrogenous manure in wheat-growing in the northern areas. Such applications are generally unremunerative.

The "commercial value" of a manure is determined by the percentage of certain constituents in its possessing fertilizing properties and their unit value. The assumption is made that the manures are all prepared from materials of the same quality and value, but this is not strictly in accord with practice as each manufacturer has his own source of supply of materials. In the table of unit values it will be seen that that the value for citrate soluble phosphoric acid is quoted as 6d. less per unit than the water soluble. The general result of Victorian experiments shows that water soluble phosphoric acid has a higher agricultural value in wheat growing that citrate soluble phosphoric acid, and it is generally assumed that its solubility enables it to come more easily within range of plant roots. In any case, after application to the soil, the water soluble phosphoric acid

becomes "reverted. The rate at which this change proceeds depends on the composition of the soil to which the fertilizer is applied, the reversion being most rapid in soils containing carbonate of lime.

A special feature of the Victorian Artificial Manures Acts is the requirement of a label or tag attached to the bags declaring the guaranteed composition by analysis of any manure sold in the State in quantities exceeding 56 lbs. at one sale. This is provided by section 7 of the principal Act, and, as a further measure of protection to farmers, it is made compulsory, under section 5, for vendors to deliver to all purchasers of manures, an invoice certificate declaring the guaranteed analysis of the manure sold. No farmer in Victoria should take delivery of manure unless the above conditions of sale are complied with. Substantial assistance would be rendered in the enforcement of the Act if farmers would immediately report any irregularity observed in the sale of manures to the Chemist for Agriculture. Additional control of the sale of manures has been provided by the amended Act, 10th October, 1905. Under section 4, sub-section (1), officers of the chemist's branch may collect samples of manures at railway stations and farms throughout the State. The results of the analysis as to the percentage of fertilizing constituents found in a manure, and the percentage claimed by the guarantee on tag and invoice certificate are published side by side along with the calculated value. These analyses are published in the *Government Gazette* and in the *Journal of the Department of Agriculture* from time to time, and should be read by all users of manures. During the past season—(February, 1906, to January, 1907)—163 samples of fertilizers were collected and the analyses published. It is quite noteworthy that almost without exception the whole of the samples in this large collection of manures were well up to guarantee, and in many instances were in excess of the percentages of fertilizing constituents guaranteed. This may be regarded as a proof of the honest endeavour of manure vendors in this State to comply, in a straightforward manner, with the requirements of the Artificial Manures Acts.

It is necessary, in order to carry out the Act, for the chemist to occasionally require purchasers of manures to forward copies of the invoice certificates supplied to them for his inspection. It has frequently been found that purchasers do not retain the invoice certificates in their possession. Every purchaser of manure is required by section 24 of the Act to keep any invoice certificate supplied by the vendor of manure for failure to produce the invoice certificate when required to do so by the Chemist for Agriculture, renders purchasers of manures liable to a penalty not exceeding £1 for the first offence, and not exceeding £5 for any subsequent offence. An amusing instance of want of knowledge on the part of a farmer of the protective objects of the Manures Acts arose during the past season. A farmer, who was asked to forward the invoice certificate supplied to him in connexion with the sale of a parcel of manure, wrote back:—"I am not long out from the mother country, and what the Artificial Manures Act is I have no idea. It is hard enough to buy manure without being threatened with a fine. My little experience of farming in this State has been anything but pleasing, and some of these odd days I will set forth my experiences as a warning to intending emigrants." The protection afforded by the Artificial Manures Acts is now thoroughly appreciated by Victorian agriculturists, and instances such as the above are extreme exceptions.

LIST OF UNIT VALUES OF MANURES IN THE MELBOURNE MARKET DURING THE 1907 SEASON.

Description of Manure.	Moisture. Per-cent-age.	Nitrogen. Per-cent-age.	Nitrogen. Estimated Value in One ton of the Manure.	Phosphoric Acid. Per-cent-age.	Phosphoric Acid. Estimated Value in One ton of the Manure.	Potash. Per-cent-age.	Potash. Estimated Value in One ton of the Manure.	Estimated Total Value of Manure per ton.	Price asked for Manure per ton Delivered at Local Railway Station.	Where Obtainable.
Mainly Nitrogenous.			£ s. d.		£ s. d.		£ s. d.	£ s. d.	£ s. d.	
Sulphate of Ammonia	..	20.55	14 14 6	..	..	..	..	14 14 6	14 2 6	Metropolitan Gas Coy., Melbourne
" "	..	19.30	13 16 8	..	..	..	..	13 16 8	14 10 0	Cuming, Smith, and Co., Melbourne
" "	..	19.63	14 1 4	..	..	..	..	14 1 4	15 0 0	Mt. Lyell Mining and Railway Coy., Melbourne
Nitrate of Soda	..	16.00	12 8 0	..	..	..	..	12 8 0	14 0 0	" " " "
" "	..	15.71	12 3 6	..	..	..	..	12 3 6	12 10 0	Cuming, Smith, and Co., Melbourne
Blood Manure	11.50	7.86	4 6 6	2.58	0 7 9	..	..	4 14 3	5 0 0	Mt. Lyell Mining and Railway Coy., Melbourne
" "	21.45	11.17	6 2 10	1.45	0 4 4	0.08	0 0 5	6 7 7	7 10 0	W. Angliss and Co., Footscray
" " (No. 2, Deniliquin)	16.27	11.48	6 6 3	2.20	0 6 7	0.10	0 0 6	6 13 4	6 15 0	J. Cooke and Co., Melbourne
" " (No. 1, Newport) ..	16.14	11.35	6 4 10	.55	0 4 8	0.04	0 0 3	6 9 9	6 10 0	" " "
" " (No. 2, Newport) ..	13.54	11.31	6 4 5	2.46	0 7 4	0.08	0 0 5	6 12 2	6 0 0	" " "
" " (Deniliquin) ..	30.53	8.90	4 17 10	2.75	0 8 3	0.39	0 2 1	5 8 2	6 10 0	" " "
Mainly Potassic.										
Kainit	..	..	..	..	..	11.40	3 2 8	3 2 8	4 10 0	Mt. Lyell Mining and Railway Coy., Melbourne
"	..	..	..	..	..	11.26	3 2 0	3 2 0	4 10 0	Cuming, Smith, and Co., Melbourne
Potash Nitrate	..	13.28	10 5 11	..	..	46.30	12 14 8	23 0 7	20 0 0	" " " "
Potash Chloride..	..	..	..	..	..	61.00	16 15 6	16 15 6	13 10 0	Mt. Lyell Mining and Railway Coy., Melbourne
" " (Muriate) ..	..	..	..	..	..	60.55	16 13 0	16 13 0	13 0 0	Cuming, Smith, and Co., Melbourne
" "	..	..	..	..	..	58.60	16 2 3	16 2 3	13 10 0	The Renard Fertilizer Coy., Melbourne
Potash Sulphate	..	..	..	..	..	51.25	14 1 11	14 1 11	14 10 0	The Mt. Lyell Mining and Railway Coy., Melbourne
" "	..	..	..	..	..	51.65	14 4 1	14 4 1	13 10 0	Cuming, Smith, and Coy., Melbourne

LIST OF UNIT VALUES OF MANURES IN THE MELBOURNE MARKET DURING THE 1907 SEASON—*continued.*

Description of Manure.	Moisture. Per-cent-age.	Nitrogen. Per-cent-age.	Nitrogen. Estimated Value in One ton of the Manure.	Phosphoric Acid. Water Soluble. Per-cent-age.	Water Soluble. Estimated Value in *One ton* of the Manure.	Citrate Soluble. Per-cent-age.	Citrate Soluble. Estimated Value in *One ton* of the Manure.	Insoluble. Per-cent-age.	Insoluble. Estimated Value in *One ton* of the Manure.	Total. Per-cent-age.	Total. Estimated Value in *One ton* of the Manure.	Estimated Total Value of Manure per ton.	Price asked for Manure per ton Delivered at Local Railway Station.	Where Obtainable.
			£ s. d.		£ s. d.		£ s. d.		£ s. d.		£ s. d.	£ s. d.	£ s. d.	
Mainly Phosphoric, Phosphoric Acid readily Soluble.														
Superphosphate, No. 1, Anchor Brand	2.07	..	..	18.53	4 3 4	1.07	0 4 3	..	..	19.60	4 7 7	4 7 7	4 2 6	Colonial Manures Coy., Melbourne
Superphosphate, No. 2, Anchor Brand	7.76	..	..	13.71	3 1 8	1.04	0 4 2	0.25	0 0 3	15.00	3 6 1	3 6 1	3 15 0	,, ,, ,, ,,
Superphosphate, No. 1	8.18	..	..	19.59	4 8 2	0.85	0 3 5	0.58	0 0 7	21.02	4 12 2	4 12 2	4 2 6	Mt. Lyell Mining and Railway Coy., Melbourne
Superphosphate, No. 2	8.08	..	..	17.54	3 18 11	1.20	0 4 10	0.61	0 0 7	19.35	4 4 4	4 4 4	4 0 0	,, ,, ,, ,,
Superphosphate, Special	8.59	..	..	21.83	4 18 3	1.70	0 6 10	1.09	0 1 1	24.62	5 6 2	5 6 2	4 15 0	,, ,, ,, ,,
Superphosphate, Concentrated	10.13	..	..	14.11	9 18 6	2.36	0 9 5	0.25	0 0 3	46.72	10 8 2	10 8 2	13 10 0	,, ,, ,, ,,
Superphosphate, Wischer's	6.92	..	..	20.35	4 11 7	0.63	0 2 6	0.82	0 0 10	21.80	4 14 11	4 14 11	4 5 0	Wischer and Co., Melbourne
Superphosphate, Wischer's Special	4.05	..	..	22.14	4 19 8	0.29	0 1 2	0.67	0 0 8	23.10	5 1 6	5 1 6	4 10 0	,, ,, ,,
Superphosphate, Wischer's No. 3	6.92	..	..	19.00	4 5 0	0.58	0 2 4	0.67	0 0 8	20.25	4 8 0	4 8 0	4 0 0	,, ,, ,,
Superphosphate, Cockbill's	6.19	..	..	17.26	3 17 8	2.04	0 8 1	..	..	19.30	4 5 9	4 5 9	4 10 0	J. Cockbill, Post Office-place, Melbourne
Superphosphate, Standard Flag Brand	5.29	..	..	19.36	4 7 1	2.34	0 9 4	0.80	0 0 10	22.50	4 17 3	4 17 3	4 2 6	Renard Fertilizer Coy. Prop. Ld., Melbourne
Superphosphate, Standard B, Flag Brand	4.09	..	..	14.30	3 4 4	1.68	0 6 9	0.67	0 0 8	16.65	3 11 9	3 11 9	4 0 0	,, ,, ,, ,,
Superphosphate, Concentrated	8.03	..	..	14.76	10 1 5	1.84	0 7 4	..	..	46.60	10 8 9	10 8 9	12 10 0	,, ,, ,, ,,
Superphosphate, Florida	4.67	..	..	21.68	4 17 7	0.22	0 0 11	0.14	0 0 1	22.04	4 18 7	4 18 7	4 2 6	Cuming, Smith, and Co., Melbourne
Superphosphate, Malden Island Guano	3.92	..	..	17.57	3 19 1	1.01	0 4 0	5.97	0 6 0	24.55	4 9 1	4 9 1	5 0 0	,, ,, ,, ,,
Superphosphate, Concentrated	12.35	..	..	41.14	9 5 2	3.78	0 15 1	..	..	44.92	10 0 3	10 0 3	12 10 0	,, ,, ,, ,,

Containing Nitrogen also.														
Dissolved Bones (late Nitro Super)	6.20	1.48	0 17 7	8.70	1 19 2	2.67	0 10 8	9.43	1 8 3	20.80	3 18 1	4 15 8	5 0 0	Cuming, Smith, and Co., Melbourne
Superphosphate, Nitro, Anchor Brand	5.28	1.30	0 18 7	9.90	2 4 6	1.56	0 6 3	6.10	0 18 4	17.56	3 9 1	4 7 8	4 17 6	Colonial Manures Coy., Melbourne
Superphosphate, Nitro ..	11.52	1.60	0 16 5	14.32	3 4 5	1.11	0 4 5	5.35	0 16 1	20.78	4 4 11	5 1 4	5 0 0	Cuming, Smith, and Co., Melbourne
” ” ..	5.50	1.98	1 0 3	8.20	1 16 11	5.33	1 1 3	6.97	1 0 11	20.50	3 19 1	4 19 4	5 5 0	S. and F. Bugg, Kyneton
Superphosphate, Nitro, Standard Flag Brand	4.20	1.10	0 11 3	10.62	2 7 9	1.35	0 5 6	9.43	1 8 3	21.40	4 1 5	4 12 8	5 0 0	The Renard Fertilizer Coy., Melbourne
Superphosphate, Nitro ..	10.61	1.84	1 0 3	15.48	3 9 8	1.09	0 4 4	1.56	0 4 8	18.12	3 18 8	4 18 11	5 0 0	Mount Lyell Mining and Railway Coy., Melbourne
Bone and Super Mixed	9.27	1.10	0 11 3	14.33	3 4 6	0.38	0 1 6	3.98	0 11 11	18.09	3 17 11	4 9 2	5 10 0	Colonial Manures Coy., Melbourne
Bonedust and Superphosphate	7.13	1.83	0 18 9	6.50	1 9 3	3.18	0 12 9	12.23	1 16 8	21.91	3 18 8	4 17 5	5 0 0	Cuming, Smith, and Co., Melbourne
Bone and Super Mixture, Standard Flag Brand	3.00	0.97	0 0 11	12.87	2 17 11	1.08	0 4 3	8.42	1 5 3	22.37	4 7 5	4 17 4	5 0 0	The Renard Fertilizer Coy., Melbourne
Bonedust and Superphosphate, No. 1	9.09	1.50	0 15 4	13.25	2 19 7	0.92	0 3 8	8.22	1 4 8	22.39	4 7 11	5 3 3	5 0 0	Mount Lyell Mining and Railway Coy., Melbourne
Phosphoric Acid, Moderately Soluble.														
Thomas' Phosphate ..	..	..	..	..	..	16.90	3 7 7	2.35	0 7 0	19.25	3 14 7	3 14 7	4 0 0	Cuming, Smith, and Co. Prop. Ld., Melbourne
Thomas' Phosphate, Standard Flag Brand	..	..	..	..	..	17.25	3 9 0	2.38	0 7 2	19.63	3 16 2	3 16 2	4 0 0	The Renard Fertilizer Coy. Prop. Ld., Melbourne
Thomas' Phosphate ..	..	..	..	..	..	17.00	3 8 0	2.73	0 8 2	19.73	3 16 2	3 16 2	4 0 0	Mount Lyell Mining and Railway Coy., Melbourne
Thomas' "Star" Phosphate	..	..	..	..	..	17.17	3 8 8	3.63	0 10 11	20.80	3 19 7	3 19 7	4 2 6	The Colonial Manures Coy., Melbourne
Thomas' "Star" Phosphate and Superphosphate	4.08	..	..	5.75	1 5 10	8.57	1 14 3	3.98	0 12 0	18.30	3 12 1	3 12 1	4 15 0	” ” ” ”
Phosphoric Acid, difficultly Soluble.														
Hasell's Marion Guano	0.50	..	..	..	..	..	..	..	..	28.75	4 6 3	4 6 3	3 10 0	A. H. Hasell, Queen-street, Melbourne
Phosphate Rock Guano	..	..	..	..	..	..	..	..	..	18.75	2 16 3	2 16 3	2 10 0	Wm. Holden, St. Leonards
Malden Island Guano ..	3.36	..	..	..	..	..	..	..	..	31.02	4 13 1	4 13 1	5 0 0	Cuming, Smith, and Co., Melbourne
Highly Carbonated Guano	1.46	..	..	..	..	..	..	..	..	27.03	4 1 1	4 1 1	3 10 0	” ” ” ”
Phosphoric Guano ..	8.10	..	..	..	..	..	..	..	..	18.71	2 16 2	2 16 2	2 10 0	J. Sinclair, Portarlington
Guano	3.42	..	..	..	..	..	..	..	..	38.30	5 14 11	5 14 11	4 15 0	Mount Lyell Mining and Railway Coy., Melbourne

LIST OF UNIT VALUES OF MANURES IN THE MELBOURNE MARKET DURING THE 1907 SEASON—*continued.*

Description of Manure.	Moisture. Per-cent-age.	Nitrogen. Per-cent-age.	Nitrogen. Estimated Value in One ton of the Manure.	Phosphoric Acid. Per-cent-age.	Phosphoric Acid. Estimated Value in One ton of the Manure.	Mechanical Condition. Per-cent-age of Fine Bone.	Mechanical Condition. Per-cent-age of Coarse Bone.	Mechanical Condition. Nitrogen. Per-cent-age in Fine Bone.	Mechanical Condition. Nitrogen. Per-cent-age in Coarse Bone.	Mechanical Condition. Phosphoric Acid. Per-cent-age in Fine Bone.	Mechanical Condition. Phosphoric Acid. Per-cent-age in Coarse Bone.	Estimated total Value of Manure per ton.	Price asked for Manure per ton Delivered at the Local Railway Station.	Where Obtainable.
												£ s. d.	£ s. d.	
Containing Phosphoric Acid and Nitrogen—Phosphoric Acid Difficultly Soluble.														
Bonemeal	6.75	3.68	1 16 0	25.38	4 0 11	19.00	81.00	0.69	2.99	4.82	20.56	5 10 11	6 0 0	Cuming, Smith, and Co. Prop. Ld., Melbourne
Bonedust	6.63	2.55	1 5 4	22.70	3 14 8	29.00	71.00	0.73	1.82	6.58	16.12	5 0 0	5 10 0	,, ,, ,, ,,
Bonedust, Special	5.60	5.18	2 12 2	18.05	3 1 1	38.00	62.00	1.96	3.22	6.85	11.20	5 13 3	6 0 0	,, ,, ,, ,,
Animal Fertilizer (Deniliquin) ..	9.46	6.75	3 8 2	10.33	1 15 2	41.00	59.00	2.76	3.99	4.23	6.10	5 3 4	5 10 0	J. Cooke and Co., Melbourne
Newport Animal Fertilizer, No. 1	4.06	5.68	2 15 4	12.85	2 0 8	16.50	83.50	0.93	4.75	2.12	10.73	4 10 0	5 10 0	,, ,, ,,
Animal Fertilizer No. 2, Deniliquin	4.60	5.75	2 19 5	15.50	2 15 3	55.70	44.30	3.22	2.53	8.68	6.82	5 14 8	5 15 0	,, ,, ,,
Blood Digester Refuse and Wood Ash	5.68	6.88	3 8 4	10.80	1 15 7	29.80	70.20	2.05	4.83	3.21	7.59*	5 4 11	5 15 0	Thos. Borthwick and Sons, Portland
Bonedust and Blood	11.87	2.06	1 0 8	25.98	4 7 6	37.20	62.80	0.76	1.30	9.66	16.32	5 8 2	6 0 0	Turner Bros., Ballarat East
Blood and Bone	6.07	5.60	2 16 0	17.00	2 16 9	34.00	66.00	1.90	3.70	5.78	11.22	5 12 9	6 0 0	W. Angliss and Co., Footscray
Magic Fertilizer	7.01	1.54	0 15 5	15.26	2 11 4	37.00	63.00	0.57	0.97	5.64	9.62	3 6 9	4 0 0	G. Gardiner, Marshalltown, Geelong
Bonedust, Magic, No. 1 ..	9.31	9.10	4 7 4	8.23	1 5 3	5.66	94.34	0.55	8.55	0.49	7.74	5 12 7	6 0 0	,, ,, ,, ,,
Bonedust, Magic, No. 2 ..	6.04	2.89	1 8 3	18.30	2 18 5	19.26	80.74	0.54	2.35	3.47	14.83	4 6 8	5 0 0	,, ,, ,, ,,
Bonedust, Magic, No. 3 ..	7.92	1.91	0 19 2	17.83	2 19 11	35.90	64.10	0.69	1.22	6.42	11.41	3 19 1	4 12 6	,, ,, ,, ,,
Bonedust	5.88	2.60	1 5 11	18.15	3 0 4	32.40	67.60	0.83	1.77	5.88	12.27	4 6 3	5 5 0	H. J. Feore and Co., Richmond
,, ...	3.43	3.97	1 19 4	24.19	3 19 2	27.50	72.50	1.09	2.88	6.65	17.54	5 18 6	6 0 0	J. R. Jopling, Ballarat
,, ...	6.48	3.96	1 18 6	21.58	3 8 3	16.80	83.20	0.66	3.30	3.62	17.96	5 6 9	5 5 0	J. W. Branch, Geelong
,, ...	5.29	3.68	1 18 1	22.96	4 1 11	56.90	43.10	2.09	1.59	13.06	9.90	6 0 0	6 0 0	Mt. Lyell Mining and Railway Coy., Melbourne
,, ...	7.59	4.21	2 0 7	20.46	3 3 5	9.40	90.60	0.42	3.79	2.04	18.42	5 4 0	5 5 0	Alfred Day, Bendigo
,, ...	16.57	2.44	1 4 10	15.18	2 12 7	16.90	53.10	1.14	1.30	7.11	8.07	3 17 5	5 10 0	Patk. Fitzgerald, East Brighton
,, ...	4.65	4.33	2 1 10	21.31	3 0 2	10.60	89.40	0.47	3.86	2.34	18.97	5 8 0	5 10 0	J. Cockbill, Post Office-place, Melbourne
,, ...	11.19	3.05	1 10 2	12.57	2 0 11	25.50	74.50	0.79	2.26	3.26	9.31	3 11 1	5 10 0	A. W. Redman, Union-street, Brunswick

Bonedust	8.04	3.47	1 15 0	23.75	4 0 3	38.80	61.20	1.34	2.13	9.21	14.54	5 15 3	6 0 0	E. Owen, Allansford
"	7.40	3.76	1 17 8	22.00	3 13 6	33.80	66.20	1.27	2.49	7.48	14.52	5 11 2	5 10 0	P. Rohs, Bendigo
"	7.12	3.02	1 11 0	22.41	3 18 5	50.31	49.69	1.52	1.50	11.21	11.20	5 9 5	5 15 0	Heinz Bros., Ballarat
"	8.54	3.53	1 14 7	20.80	3 6 7	20.00	80.00	0.70	2.83	4.16	16.64	5 1 2	5 10 0	A. E. Kleiner, Wangaratta
"	6.37	3.97	1 19 5	22.81	3 13 6	29.35	70.65	1.16	2.81	6.54	15.77	5 12 11	5 10 0	S. and F. Bugg, Kyneton
"	6.08	3.75	1 17 7	20.75	3 9 7	35.50	64.50	1.32	2.43	7.36	13.39	5 7 2	5 12 6	J. R. Ellsworth, Ballarat East
Bonedust (Anchor Brand) ..	5.00	4.48	2 5 4	20.66	3 10 3	40.30	59.70	1.80	2.68	8.32	12.34	5 15 7	6 0 0	Colonial Manures Coy., Melbourne
Bonedust (A.N.A. Surprise) ..	6.05	2.82	1 7 9	15.71	2 10 9	22.80	77.20	0.65	2.17	3.62	12.09	3 18 6	5 0 0	Pennell Bros., Braybrook
Bonedust (Apollo)	5.32	4.90	2 9 5	17.86	3 0 7	39.00	61.00	1.91	2.99	6.97	10.89	5 10 0	6 0 0	J. Kitchen and Sons Ld., Melbourne
Bonedust (Kensington) ..	5.82	3.48	1 15 0	20.53	3 9 2	37.20	62.80	1.29	2.19	7.59	12.94	5 4 2	5 10 0	" " " "
Bonedust (Waddell)	7.30	3.14	1 11 11	20.18	3 9 3	43.00	57.00	1.36	1.78	8.68	11.50	5 1 2	5 5 0	" " " "
Bonedust (Standard Flag Brand)	5.28	3.57	1 17 6	22.61	4 3 0	66.50	33.50	2.39	1.18	15.14	7.47	6 0 6	6 0 0	Renard Fertilizer Coy. Prop. Ld., Melbourne
Bonedust (Koona)	4.99	2.02	1 0 8	10.08	1 15 3	49.60	50.40	1.00	1.02	5.00	5.08	2 15 11	6 0 0	A. J. Stewart, Koonwarra
Bonedust	8.08	4.30	2 2 4	23.75	3 16 6	21.95	78.05	0.94	3.36	5.21	18.54	5 18 10	6 0 0	Chas. Sargeant, Warragul
"	4.85	3.11	1 11 1	18.57	3 1 10	33.00	67.00	1.02	2.09	6.13	12.44	4 12 11	5 10 0	E. T. Hoskin, Eagle Point, Bairnsdale

Description of Manure.	Moisture.	Nitrogen.		Phosphoric Acid.								Potash.		Estimated Total Value of Manure per ton.	Price asked for Manure per ton Delivered at Local Railway Station.	Where Obtainable.
				Water Soluble.		Citrate Soluble.		Insoluble.		Total.						
	Percentage.	Percentage.	Estimated Value in One ton of the Manure.	Percentage.	Estimated Value in One ton of the Manure.	Percentage.	Estimated Value in One ton of the Manure.	Percentage.	Estimated Value in One ton of the Manure.	Percentage.	Estimated Value in One ton of the Manure.	Percentage.	Estimated Value in One ton of the Manure.			
			£ s. d.		£ s. d.		£ s. d.		£ s. d.		£ s. d.		£ s. d.	£ s. d.	£ s. d.	
Mixed Manures, containing Nitrogen, Phosphoric Acid and Potash.																
Potato Manure ..	5.83	0.90	0 9 3	8.92	2 0 2	0.95	0 3 10	9.71	1 9 1	19.58	3 13 1	5.92	1 12 7	5 14 11	6 0 0	Cuming, Smith, and Co. Propy. Ld., Melbourne
Orchard and Onion Manure No. 2	10.72	1.18	0 16 11	15.58	3 10 1	0.51	0 2 0	5.18	0 15 6	21.27	4 7 7	2.77	0 15 3	5 19 9	6 0 0	" " "
Grass Manure—For Laying Down	7.87	1.57	1 4 4	9.72	2 3 9	0.46	0 1 10	11.86	1 15 7	22.04	4 1 2	4.86	1 6 9	6 12 3	6 0 0	" " "
Grass Manure—For Top Dressing	9.45	1.97	1 8 3	16.28	3 13 3	..	..	3.25	0 9 9	19.53	4 3 0	..	..	5 11 3	6 0 0	" " "
Leguminous Manure ..	11.74	..	..	16.76	3 15 5	0.42	0 1 8	4.02	0 12 1	21.20	4 9 2	1.87	0 10 3	4 19 5	5 0 0	" " "
Horticultural and Tomato Manure	5.23	2.56	1 19 8	10.80	2 8 7	0.15	0 0 7	2.48	0 7 5	13.43	2 10 7	10.85	2 19 8	7 15 11	8 10 0	" " "

* Contains also 0.17 Potash.

LIST OF UNIT VALUES OF MANURES IN THE MELBOURNE MARKET DURING THE 1907 SEASON—*continued.*

Description of Manure.	Moisture. Per-cent-age.	Nitrogen. Per-cent-age.	Nitrogen. Estimated Value in One ton of the Manure.	Phosphoric Acid. Water Soluble. Per-cent-age.	Phosphoric Acid. Water Soluble. Estimated Value in One ton of the Manure.	Phosphoric Acid. Citrate Soluble. Per-cent-age.	Phosphoric Acid. Citrate Soluble. Estimated Value in One ton of the Manure.	Phosphoric Acid. Insoluble. Per-cent-age.	Phosphoric Acid. Insoluble. Estimated Value in One ton of the Manure.	Phosphoric Acid. Total. Per-cent-age.	Phosphoric Acid. Total. Estimated Value in One ton of the Manure.	Potash. Per-cent-age.	Potash. Estimated Value in One ton of the Manure.	Estimated Total Value in Manure per ton.	Price asked for Manure per ton Delivered at Local Railway Station.	Where Obtainable.
			£ s. d.		£ s. d.		£ s. d.		£ s. d.		£ s. d.		£ s. d.	£ s. d.	£ s. d.	
Mixed Manures, containing Nitrogen, Phosphoric Acid and Potash—continued.																
Maize Manure ..	10.56	1.92	1 7 6	14.72	3 6 3	0.61	0 2 5	2.52	0 7 6	17.85	3 16 2	3.10	0 17 0	6 0 8	6 0 0	Cuming, Smith, and Co. Propy. Ld., Melbourne
Rose Manure	10.33	3.71	2 17 6	5.05	1 2 8	1.66	0 6 7	1.58	0 4 9	8.29	1 14 0	14.00	3 17 0	8 8 6	12 0 0	" " "
Tobacco Manure ..	8.50	4.74	2 8 7	0.75	0 3 5	3.02	0 12 1	3.08	0 9 3	6.85	1 4 9	7.58	2 1 8	5 15 0	8 0 0	" " "
Potato Manure ..	*13.32*	1.20	0 17 2	15.72	3 10 8	1.42	0 5 8	2.11	0 6 4	19.25	4 2 8	4.08	1 2 5	6 2 3	6 0 0	Mount Lyell Mining and Railway Coy., Melbourne
Onion Manure ..	9.81	3.02	1 17 2	11.60	2 12 2	1.15	0 4 7	1.22	0 3 8	13.97	3 0 5	3.09	0 17 0	5 14 7	6 0 0	" " "
Orchard Manure ..	9.20	1.78	0 18 3	14.15	3 3 8	0.86	0 3 5	1.45	0 4 4	16.46	3 11 5	6.15	1 13 10	6 3 6	6 10 0	" " "
Grass Manure ..	9.91	..	..	5.82	1 6 2	10.25	2 1 0	4.23	0 12 8	20.30	3 19 10	1.39	0 7 7	4 7 5	4 5 0	" " "
Root Crop Manure ..	13.51	3.71	2 3 0	10.27	2 6 3	1.06	0 4 3	1.11	0 3 4	12.44	2 13 10	4.91	1 7 0	6 3 10	6 10 0	" " "
Maize and Fodder Crop Manure	*13.21*	*2.04*	*1 18 1*	*14.63*	*3 5 10*	*0.77*	*0 3 0*	*1.03*	*0 3 1*	*16.43*	*3 11 11*	*1.50*	*0 8 3*	*5 16 3*	*6 0 0*	" " "
Potato and Vegetable Manure, Standard Flag Brand	6.40	1.14	0 11 8	11.30	2 10 10	1.30	0 5 3	7.10	1 1 3	19.70	3 17 4	3.08	0 16 11	5 5 11	6 0 0	Renard Fertilizer Coy. Prop. Ld., Melbourne
Grass Manure, Standard Flag Brand	4.96	0.89	0 9 1	10.50	2 7 3	1.58	0 6 4	6.84	1 0 6	18.92	3 14 1	0.58	0 3 2	4 6 4	5 0 0	" " "

W. PERCY WILKINSON,
Government Analyst for Victoria
and
Acting Chemist for Agriculture.

Government Laboratory,
Melbourne, 2nd January, 1907.

DAIRY FARM BUILDINGS.

S. S. Cameron, M.R.C.V.S., Chief Veterinary Officer.

A glance at the first two of the accompanying illustrations, and a comparison of them, will convey some idea of what it is hoped will be accomplished on many dairy farms as a result of that close contact of experts with dairy farmers which is made possible under the Milk and Dairy Supervision Act. The transformation of the squalid insanitary cow-shed, sloppy and slushy in wet weather, and dusty in dry, which has been all too much the vogue in the past, into a convenient and cleanly building, in which the comfort of both the cows and their caretakers is provided for, is a change demanded alike by sanitary and commercial considerations.

The dairy farmer is often loth to concede that these two considerations are compatible. He is prone to think that outlay on sanitary requirements is a needless and unprofitable expenditure. But such thoughts are only entertained by those who have had no experience of the benefits that are unquestionably derivable from the provision of adequate milking and housing accommodation for the herd. Once a man has tackled the job, either through the promptings of his own better sense, or the importunities of the much-maligned inspector, and the improvements have been effected, his testimony in favour of the change is unqualified and complete.

A case rises to mind in which some time back a certain dairy farmer was "dragooned," on fear of the law's rigour, into reflooring and reroofing his milking shed, and paving his cow-yard. It was done with a bad grace, even though the yard was knee-deep in mire and mud, and the cow-shed floor so cut up and filth-soaked that members of the family were continually bickering and quarrelling amongst themselves because of the discomfort attendant on the work of milking and bailing up. They were a bedraggled, careless, and resentful lot, well matching the lean tucked-up herd of scrubbers that were daily hustled out of the yard bog into the rickety bails, and the "old man" was often left to do the milking "on his own." It can easily be imagined that under such circumstances the business was not a paying one and the said old man's cup of bitterness was persistently full. The overflowing stage was reached when Mr. Inspector came along and insisted on new this and extra that, repair here and improvements there. Riven between exasperation and fear, a decision to conform to the requirements of the Act was come to. The fast-diminishing hoard of earlier years was widely broached, and the improvements effected. The squalor of the "old order" gave place to the cheerfulness of the "new."

Two years later I (the aforesaid inspector) was the most heartily-welcomed visitor to the place, and many times since have I been called blessed for the part I played in effecting the change. It was a change for the better all along the line; for, with the advantages of the new shed proven, with the family pulling together, the wife and girls cheerfully and regularly taking their part in the milking, leaving the boys more time for fodder cultivation, and with the farm "paying, sir," as the old man gleefully announced, it was a somewhat easy matter to impress further advice. Recording daily milk yields, culling the herd, intensive cultivation

of fodder crops, and their preservation in a silo, hand-feeding, and winter housing, have been successively and successfully adopted. The herd has been nearly doubled in numbers, and its quality improved four fold; so that now there are few more comfortable and prosperous dairy farms in the State. While the change from poverty to prosperity cannot be wholly credited to the initial improvement of the buildings, it was, nevertheless, the "new shed" which gave things a start on the up-grade, and made all the other advances possible.

The moral is obvious, and if it has been clearly pointed, the unintended digression from a description of a modern cow-shed, as herewith illustrated, will have been justified.

The principal features of the shed illustrated are:—

1st. *Simplicity and Cheapness of Construction*, whereby, in addition to a 24-bail closed-in cow-shed, two calf pens or hospital cow boxes, a commodious loose box and an implement shed are provided under one roof

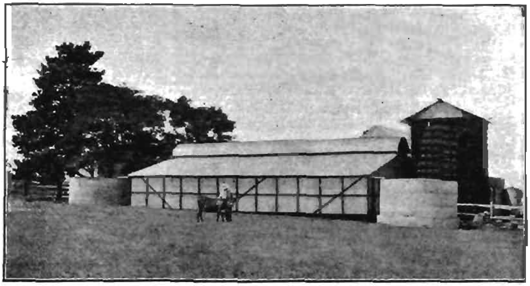
"THE OLD ORDER

on land 40 feet x 54 feet. It will be noticed that the construction throughout (stalls, partitions, principals, rafters, studs, &c.), are arranged on what may be termed a "4 ft. 6 in. plan." This, while providing adequate strength of structure and the proper width of stalls, results also in the saving of a considerable amount of timber. It may be said, in fact, that there is not an inch of useless timber in the building, nor yet is there an inch short of what is required to insure stability.

2nd. *Smooth Internal Wall Surfaces*, secured by the adoption of the somewhat novel plan of placing the wall iron on the inside of the studs instead of the outside. The accumulation of dirt, *débris*, chaff, litter, cobwebs and the like in the corners and angles formed by the studs and battens when on the inside, is thereby prevented, and the sweeping of the floor near the wall foot, and cleaning of the wall surface near the floor are greatly facilitated. The need for lime-washing is done away with, as the smooth surface can be more quickly and effectively cleaned by swabbing it at required intervals with a cheap and odourless disinfectant solution, such as Condy's fluid or formalin solution. A further advantage of the adoption of this plan is that, incidentally, it provides a perfect

system of protected air inlets, the full width of the studs and wall plates all round the building at the eaves.

Two objections may be raised by the thoughtless against this innovation, and it may be as well to anticipate and dispose of them at once. They are, firstly, that the stud timbers are exposed to the weather, and will not last; and, secondly, that the appearance of the building is spoiled. Touching the first of these objections, the fact is vouched for by experienced architects that the life of hardwood timber so exposed, and without being painted, tarred, or dressed in any way, will be as long as the iron and other parts of the building can be reasonably expected to last; and if tarred before erection, it will certainly outlast the remainder of the building. The æsthetic objection will at once be seen to be groundless by a glance at the photograph; for it can scarcely be denied that the relief to the eye afforded by the chequered design of the outside studs is infinitely more taking than a bare expanse of plated iron.



AND THE NEW."

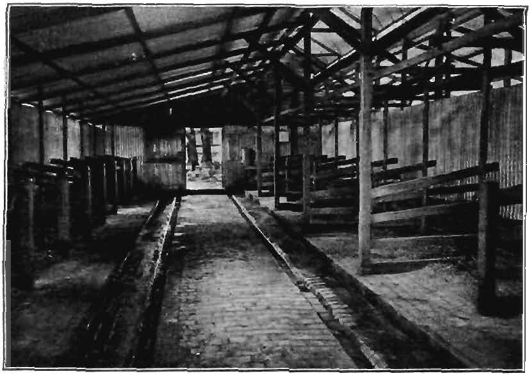
3rd. *Perflation, Ventilation, and Light.*—Mainly because of the large open space above the partition dividing the cow-shed from the implement shed and boxes, copious perflation and ventilation is provided, without draughts. The shed has been in use for a year and housed a full complement of cows for five months during the winter, and the experience has been that at no time has it been stuffy, or cold, or other than sweet and free from cowy odours. The ample area of air inlets has been referred to above.

Sufficiency of light is maintained largely by means of reflected light through the space above-mentioned. Two panes of corrugated glass, in the form of skylights in the roof, are also provided. That the light is adequate will be seen by reference to the photograph of the interior, which was taken on a dull day, with the usual exposure and without artificial aid.

4th. *Platform Stall Floors, and Guttered Gangway.*—The construction of the floor is unusual, but with a daily experience of its practical effectiveness, and the facilities it affords above all others for cleanliness, I am prepared to uphold that it is absolutely the best formation of floor for a cow-shed, whether used for milking only or for night-housing, or for milking and night-housing combined.

The floor, as shown, provides a raised kerbing, dung space, and drainage gutter at the rear of the cow. This is a modification of and improvement on the upright sided rear gutter that I have advocated for years. In a pamphlet prepared by me, and published by the Board of Public Health in 1901, I wrote as follows:—

"Surface drains or gutters or grips should be constructed at rear of stalls. These grips should extend the whole length of the building, and should be 12 inches in width. When constructed with a flat bottom and upright sides (see Fig.) the removal of the dung and fluids is greatly facilitated, the tools used being a square-faced shovel, a wooden scraper or rubber "squee-jee," and a suitably-sized whale-bone brush. Another advantage of the flat-bottomed and upright-sided grip is that it prevents excessive splashing of the urine and soft dung, and, further, when the



INTERIOR OF COW SHED.

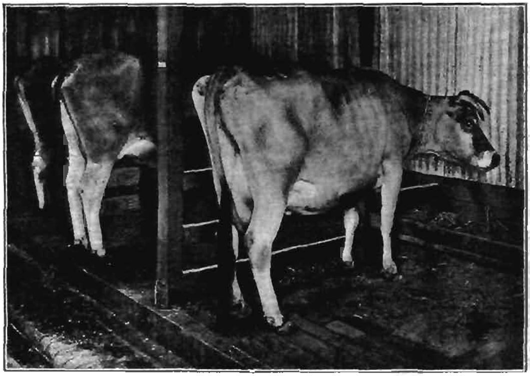
cow lies down, her rump, quarters, and udder lie clear of the contents of the grip. Although this style of open drain or gutter or grip is seldom seen in Victoria, it is almost universally adopted in byres and cow-sheds in the British Isles, European countries, and New Zealand, and for the reasons above stated is found to be a much cleaner, more satisfactory, and

SQUARE-BOTTOMED GRIP.

convenient drain than the "three-brick" or sloping-sided drain. The objection most commonly urged against it on first impressions is that the cows would be likely to step into it on entering the stall, or their hind feet slip into it when standing in the stall, and that injury would thereby result. As a matter of fact, cows more frequently slip when the sloping-

sided drain is provided, and they very quickly become accustomed to stepping *over* the upright-sided gutter. During a veterinary and dairying experience, extending over twenty years, I have never known of a case in which the grips described were responsible, directly or indirectly, for injury to a cow."

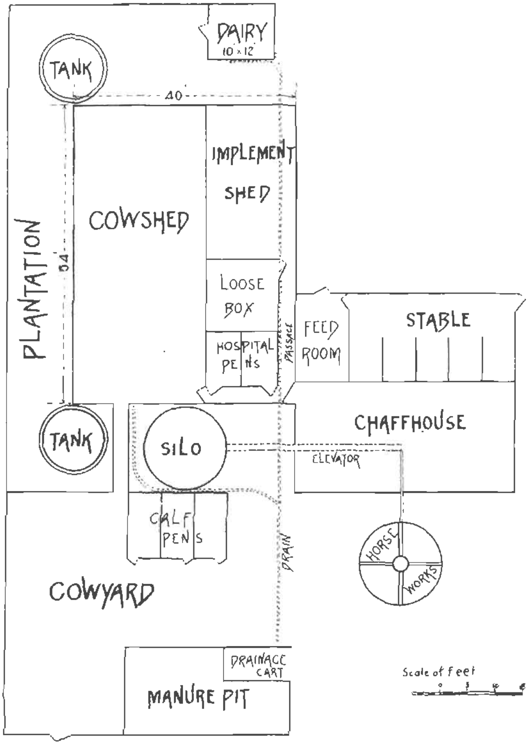
The square-bottomed and upright-sided gutter, however, has the disadvantage that when dung has been deposited in it, the urine is prevented from flowing along it. In the floor now advocated, and shown in the photograph in which the gangway is at a six-inch lower level than the kerb of the stalls, the urine drops back into the small gutter, and flows away past the dung deposited in the dung space. The gutter, in fact the whole floor, has a fall lengthways of 1 inch in 9 feet, giving a total fall of 6 inches throughout the length of the building (54 feet).



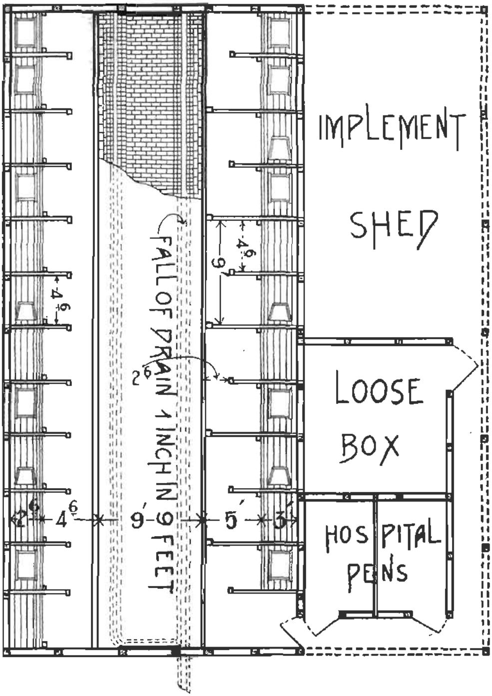
INTERIOR VIEW, SHOWING AVERAGED-SIZED COWS STANDING ON THE PLATFORM STALL IN A SPACE 5 FEET FROM TYING POST TO KERB.

An essential feature of the platform stalls is that they should not be too long. Five feet, or at the very outside, 5 ft. 6 in. from the bail or chain post is ample for the biggest shorthorn likely to be milked, while not more than 4 ft. 6 in. should be allowed for the smaller cows and heifers. If longer stall space is given the cows will drop their dung on the platform floor instead of over the edge of the kerb into the dung space. The measurements given will seem all too small to most people until they are told, or find out by actual measurement, that it is a very big cow indeed which will measure more than 5 ft. 6 in. from behind the ears to the root of the tail.

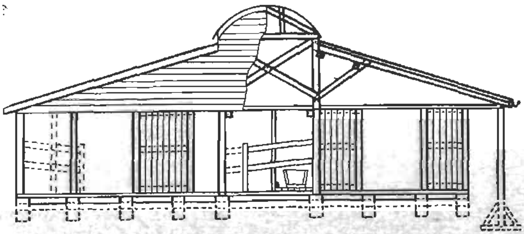
Reference to the plate showing the interior with cows standing in the stalls, which, in this instance, are 5 feet from chain post to kerb, will show that ample standing room is given. All three cows shown are big-framed Jerseys, certainly up to the average in size of the dairy cows in this State. The hind feet of the first one are seen to be 9 or 12 inches forward from the kerb. She is standing somewhat forward through cringing from the camera, but when standing comfortably in milking position she has ample room. The second cow is standing slightly



LOCALITY PLAN.



GROUND PLAN.



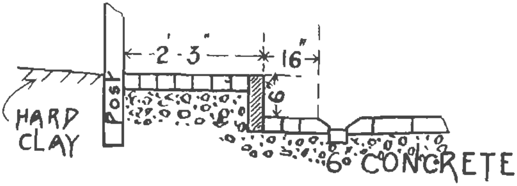
ELEVATION.

backward, with her hind legs in milking position, and the feet are on the edge of the kerb. She has recently passed dung which is seen to have dropped over the edge of the kerb and clear of the standing floor, so that it does not get paddled about, and the floor is left clean in case the animal lies down. The usual position of the droppings is also shown behind the third cow.

SECTION OF GANGWAY AND STALLS, SHOWING PLATFORM STALLS, DUNG SPACE AND GUTTER.

Out of twenty-four cows continuously stalled over night in this shed during the winter, fourteen regularly passed their droppings and urine over the kerb into the dung space, and their quarters were maintained in a clean state throughout. Six others were erratic in this respect, while the four remaining ones (heifers) were habitually "dirty," always dunging forward on the stall floor.

Some question may be raised as to cows not being all the same size, and therefore variation in the length of stall floors would appear to be necessary. In the shed under review the stalls on one side are 5 feet from the chain post to kerb, and these are used for the biggest cows. The smaller cows and heifers are on the other side, where the floor is 4 ft. 6 in. from post to kerb. Every chain post is, however, capable of being moved 6 inches either way, forward or backward, so that stall lengths varying from 5 ft. 6 in. to 4 ft. can be arranged for in a few minutes. The chain posts are simply bolted on to the rafters and stall frame, and the bolts can be readily withdrawn and placed in holes provided either forward or backward. Of course, this adjustment of stall lengths cannot be arranged for if the cows are fastened by bails. It is difficult, however, to see what advantage bails have over chain fasten-



DETAIL OF PLATFORM KERB, DUNG SPACE AND GUTTER.

ing. Personally, I never saw a bail until I came to Australia, and my previous experience of cow-sheds in England and Scotland had been life-long, and gained in widely-separated districts.

5th. *Short Stall Partitions.*—It will be seen from the interior photograph, that the partition frames between the stalls on one side are very short, extending only 5 feet from wall, and 2 ft. 6 in. from chain post, so leaving a space of 2 feet between the heel post and the kerb. On the other side the stall partitions are alternately long and short, the former extending backward to the edge of the kerb. This was a necessity of construction, the principals to carry the roof being placed 9 feet apart, and constituting the heel post of each alternate stall. Short stall partitions serve the same purpose as those extending a long way behind the cow, and they have at least three advantages over the latter. In the

first place, the cost of a considerable quantity of timber is saved. Secondly, they are certainly more sanitary, in that they do not become fouled with dung. The heel posts of the long partition are usually the dirtiest surfaces in a cow-shed, and require most scraping and cleansing. With the short partitions, again, the milking machine may be installed without any alterations being required.

It may be said that heel posts extending a long way backward are needed for leg-roping. Well, if leg-roping is required (and I am one of those who believe that it is not required, and should be abandoned, except perhaps in the case of 5 per cent. of cows at the outside), it can be provided for by having a wooden block containing a spike and ring placed in the floor of the gangway at the proper distance to the rear. As with the use of bails, so with leg-roping it was not until my arrival in Australia that my first experience of that practice was gained.

In this shed the feed tubs are moveable, and are placed on a raised platform 2 ft. 6 in. wide on one side and 3 feet on the other, running the whole length of the building. The platform is made of 6 in. x 1 in. hardwood, with a plinth of similar dimensions to keep the tub in position. When not containing food the tub may be upended on the feed platform, so leaving space for the feeding of hay or other long fodder.

Incidentally, a final glance at the interior photograph is requested, and attention invited to the towel rack, the water drum and tap, the spring balance, and the milk records board at the far end of the building, the regular use of all of which should be obvious.

A locality plan, given along with the ground plan and elevation of the shed illustrated is not in any way to be taken as a model of arrangement of dairy farm buildings, but to show the relationship of the other building to the cow-shed in question, and to give an idea of the compactness which ought to be aimed at where choice of arranging the location offers.

THE ORCHARD.

James Lang, Harcourt.

Gathering and marketing the fruit will occupy a great deal of the time of the orchardist for the next three months. The export season opens this month, the first shipment leaving by the s.s. *Britannia* on the 19th inst. In view of the many complaints that have been made as to the condition in which the early shipments of apples have arrived in previous years, shippers should be very careful in selecting and packing only sound fruit. The trouble has been bitter pit, which seems to develop in the cool chamber on the voyage; apples apparently clean and sound when shipped have arrived in a bad state from this disease. Later shipments do not develop it to anything like the same extent, the fruit being better matured. So far no remedy has been discovered that will keep the disease in check. From advice to hand from London, the market there will be pretty well cleared of American apples by the time the first shipments arrive from Australia, so that a favorable market is likely for all fruit arriving in good condition.

Continue spraying for the codlin moth. Where this has been constantly attended to the fruit will be very free from the grub, and 90 per cent. should be clean and fit for market. In carrying out the work of the orchard, spraying is very apt to be neglected, on account of other pressing work. It is a great mistake to do this, as spraying should be done regularly, no matter what other work has to stand aside. It is an advantage

to spray up to the beginning of March, so that the second brood of moths is destroyed.

In many orchards this season the woolly aphis has been unusually prevalent on the apple trees, being caused by the moist state of the ground in the early spring. It is very difficult to combat this pest during the summer months, as the different insecticides in use have very little effect upon it when sprayed. The best time to cope with it is in the winter, just after the trees have been pruned. The best remedy is as follows:—Take 2 lbs. of potash, and dissolve in half a gallon of water, then mix in 2 lbs. sulphur; when these two are thoroughly mixed add sufficient raw linseed oil to dilute it to the consistency of paint. If the mixture should get thick after standing some time, add more linseed oil to thin it down. The mixture is applied by using a small paint brush, and rubbing well in on the parts affected. This may seem a very slow process, but it is effectual. About a month after the first dressing go over the trees again, and if any blight is showing, treat the spots affected. If this course is carefully carried out the woolly aphis will not give much trouble for some years. The writer has used the remedy for thirty years, and has always found it effective. Spraying with red oil and kerosene emulsion is not nearly so effective and lasting.

STATISTICS.

Fruit, Plants, Bulbs, Grain, &c.

IMPORTS AND EXPORTS INSPECTED DURING QUARTER ENDED 31ST DECEMBER, 1906.

Description of Produce.	Imports.		Exports.		Description of Produce.	Imports.		Exports.	
	Australasian.	Oversea.	Australasian.	Oversea.		Australasian.	Oversea.	Australasian.	Oversea.
Apples ...	12,456	920	289	1	Beans ...	2,285	84	—	—
Apricots ...	24	—	5,719	163	Cucumbers	10,267	—	283	45
Bananas, b.s.	158,563	1,348	—	—	Melons ...	114	—	6	—
Bananas, c/s.	5,122	—	1,718	38	Onions ...	—	102	—	—
Blk. currants	42	—	—	—	Peas ...	611	25	—	—
Cherries ...	126	—	2,951	3,680	Potatoes ...	1,164	—	47	2
Gooseberries	59	—	236	—	Nuts ...	73	419	—	—
Granadillas	1	—	—	—	Nutmegs ...	—	2,708	—	—
Lemons ...	1,981	5,855	738	514	Seeds ...	581	14,699	—	—
Loquats ...	1,687	—	55	—	Barley ...	3,287	—	—	—
Mandarins	—	—	—	6	Maize ..	112	15	—	—
Mixed fruit	109	12,575	5	271	Wheat ...	13	—	—	—
Oranges ...	76,577	4,117	1,805	202	Rice ...	—	49,797	—	—
Passion fruit	1,164	—	47	2	Plants ...	75	153	51	6
Peaches ...	24	—	213	62	Bulbs ...	—	232	—	—
Pears ...	—	27	3	—	Jams ...	—	—	—	668
Pineapples	8,700	—	248	86	Sauces ...	—	—	—	2
Plums ...	9	—	99	163	Pickles ...	—	—	—	1
Red currants	1	—	—	—	Canned frts.	—	—	—	1,167
Strawberries	35	—	—	—					
Tomatoes ...	25,684	—	445	108	Total Packages	310,498	93,490	14,911	7,185

Total number of packages inspected = 426,084.

J. G. TURNER,
Inspector Vegetation Diseases Acts and Commerce Act.

Rainfall in Victoria.

Fourth Quarter, 1906.

Table showing average amount of rainfall in each of the 26 Basins or Regions constituting the State of Victoria for each month and the quarter, with corresponding monthly and quarterly averages for each Basin deduced from all available records to date.

Basin.	October. Amount, 1906.	October. Average.	November. Amount, 1906.	November. Average.	December. Amount, 1906.*	December. Average.	Total for Fourth Quarter.*	Average for Fourth Quarter.
Glenelg and Wannon Rivers	2.98	2.75	4.09	1.74	0.47	1.53	7.54	6.02
Fitzroy, Eumerella, and Merri Rivers	3.24	2.91	4.31	1.82	0.50	1.59	8.05	6.32
Hopkins River and Mount Emu Creek	3.63	2.76	4.43	1.97	0.44	1.51	8.50	6.24
Mount Elephant and Lake Corangamite	3.69	2.67	4.15	1.87	0.71	1.39	8.55	5.93
Otway Forest	4.73	3.66	4.48	2.39	0.44	1.89	9.65	7.94
Moorabool and Barwon Rivers	3.91	2.56	3.73	2.03	0.62	1.56	8.29	6.15
Werribee and Saltwater Rivers	3.45	2.68	2.51	2.18	0.69	1.69	6.65	6.55
Yarra River and Dandenong Creek	4.55	3.23	4.29	2.86	1.57	2.59	10.41	8.68
Koo-wee-rup Swamp ...	5.05	3.49	4.32	2.66	0.85	2.14	10.22	8.29
South Gippsland	6.01	3.49	4.24	2.80	1.44	2.59	11.69	8.88
La Trobe and Thomson Rivers	4.85	3.53	4.44	2.79	2.78	2.56	12.07	8.88
Macallister and Avon Rivers	3.44	2.82	2.62	2.34	2.81	2.26	8.87	7.42
Mitchell River	3.73	2.91	2.20	2.25	3.97	2.12	9.90	7.28
Tambo and Nicholson Rivers	3.93	2.77	2.42	1.96	4.00	2.15	10.35	6.88
Snowy River	4.34	3.03	3.16	2.49	2.51	3.09	10.01	8.61
Murray River	2.99	1.92	3.59	1.58	1.45	1.35	8.03	4.85
Mitta Mitta and Kiowa Rivers	5.37	3.05	4.84	2.48	3.32	1.94	13.53	7.47
Ovens River	4.56	3.86	4.68	2.95	3.73	2.36	12.97	9.17
Goulburn River	4.00	2.42	3.60	1.99	1.53	1.48	9.13	5.89
Campaspe River	3.04	2.29	3.00	1.83	0.87	1.50	6.91	5.62
Loddon River	2.39	1.72	2.67	1.53	0.58	1.13	5.64	4.38
Avon and Richardson Rivers	1.67	1.42	2.42	1.25	0.32	0.98	4.41	3.65
Avoca River	1.77	1.67	2.15	1.39	0.63	1.05	4.55	4.11
Western Wimmera	2.08	2.05	3.08	1.25	0.51	1.17	5.67	4.47
Eastern Wimmera	2.64	2.42	3.87	1.59	0.58	1.40	7.09	5.41
Mallee Country	1.19	1.20	1.49	0.92	0.40	0.76	3.08	2.88
The whole State	3.15	2.36	3.17	1.80	1.24	1.56	7.56	5.72

* Figures in these columns are subject to alterations when the complete number of returns for December has been received.

P. BARACCHI,
Government Astronomer.

MAIZE CULTIVATION.

The illustrations on this page are eloquent of the advantages of growing maize and such like summer fodder crops in rows, whereby inter-row cultivation may be carried out at frequent intervals. A soil mulch is thereby continuously maintained, and surface evaporation of moisture prevented. While, when grown in rows, the number of plants to the acre is considerably less than when broad-casted, nevertheless the total bulk of fodder produced

TWO MONTHS' GROWTH BROAD-CASTED MAIZE.

per acre is greater. Other advantages are that little more than one-fourth the quantity of seed is required; that one-half the quantity of artificial manure will suffice, the manure being placed in the drill or furrow, where it is at once available when the rootlings are formed; and, finally, that the

TWO MONTHS' GROWTH IN DRILLS, WITH FOUR INTER-CULTIVATIONS.

maize crop may be always made a certainty of independent of the conditions of rainfall, irrigation, or the like.

The crops shown in both illustrations were sown on 7th November, and the photographs were taken on the same day (5th January). The same seed was used, 20 lbs. to the acre, in rows, and 1½ bushels (84 lbs.) for the broad-cast crop. Two hundredweights of superphosphate per acre were applied to each crop at the time of sowing. The drilled crop was scarified between the rows four times between the sowing and the taking of the photograph, while the broad-casted crop was merely harrowed and rolled after sowing and left.—S. S. C.

THE JOURNAL

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THE OUTLOOK FOR AGRICULTURE.*

T. Cherry, M.D., M.S., Director of Agriculture.

In taking a survey of the agricultural outlook for Australia at the present time, I wish first to briefly summarize some of the main facts which will determine the future of our agriculture; then to take a glance at the position of our leading products in the world's markets; and, finally, to briefly sketch the main lines on which, I think, we can maintain agriculture—the ultimate basis of a country's prosperity—in a healthy and flourishing condition.

I need hardly remind you that the true measure of the fertility of the land is the readiness with which the plant food of the soil is made available for plants which serve as food for animals or man. It is true that a certain amount of agricultural wealth consists of timber trees, and fibre plants; but, on the whole, these form accessory rather than staple products. The plant uses the energy of the sun to build up comparatively simple chemical substances into much more complex ones. These latter serve as food for the animal, and the energy of the animal is derived from the process of turning them back again into simple ones. Ultimately they are returned again to the earth or the atmosphere, and sooner or later undergo such changes that they may once more serve as food for the plant. *It is in connexion with the preparation of the food for the plant that the most far-reaching generalization of recent agricultural science has been made.* This is the discovery of the part played by microscopic plants or bacteria in producing and maintaining the fertility of the soil. Not only do they break down the excreta and dead tissues of animals into forms available for the plant, but they cause the free nitrogen of the atmosphere to combine with oxygen, and so begin the wondrous ascent which leads to living protoplasm. I am inclined to think that the best measure of the fertility of the soil is the number of micro-organisms contained in it. The soil is looked upon no longer as dead and inert, but as alive and active. No small part of the activity of soil bacteria is seen in the extent to which they form acids and alkalies from woody fibre

*Presidential address delivered before the Association for the Advancement of Science, January, 1907.

and other carbon compounds, which they use as food. Probably most of the carbonic acid, which forms one of the chief solvents in soil water, has its origin in this way, and the chemical substances formed by bacteria which are even more active, not only help to complete the weathering of the rocks, but also to change the potash and phosphoric acid from insoluble to soluble forms.

All plant life is dependent on the water supply available in the soil. How this may best be conserved and regulated is too large a question for me to enter on at present. I would only remind you that in order to produce one ton of sun-dried vegetation from 300 to 500 tons of water have to be absorbed by the roots and transpired through the leaves. That is, one ton of dried material per acre requires the utilization of the rainfall to the extent of four or five inches during the growing season.

THE SOILS OF VICTORIA.

The following table gives the result of analysis of 178 samples of soil and subsoil made within the last three years at the laboratory of the Department. For comparison I append the average results of a number of samples of ten different types of English soil (Hall), and of a very large number of American analyses (Hillgard). It will be seen that our soils are well above the recognised limits of efficiency in nitrogen—(100 parts per 100,000)—but very close to the limit of inefficiency as to phosphoric acid. European and American authorities look upon 50 parts per 100,000 as the limit below which it becomes unprofitable to work the soil. Potash and lime are so abundant in most of our soils that they call for no remark :—

AVERAGE RESULTS OF VICTORIAN, ENGLISH, AND AMERICAN SOIL.

—	Soils.				Subsoils.			
	Nitrogen.	Phosphoric Acid.	Potash.	Lime.	Nitrogen.	Phosphoric Acid.	Potash.	Lime.
Victorian Clay Soils (30) ...	149	63	205	176	100	66	232	155
,, Wheat Land (34) ...	112	61	422	1,072	89	60	706	2,487
,, Coastal Plain (85) ..	178	61	185	903	106	46	247	380
,, Volcanic (24) ..	272	61	277	588	103	42	170	1,649
,, Mallee (5) ...	113	47	380	2,426	...	...	...	...
English Typical Soils ...	175	98	463	...	...	...	.	...
American Arid (466) ..	...	117	729	1,362	...	...	...	...
,, Humid (313) ...	...	113	216	108	..	..	...	...
,, Sand (all averages) .	...	128	157	115	...	124	143	96
,, Clay ,, ,, ..	...	207	214	1,761	...	159	344	1,481

Considering first the soils of Australia, I presume that so far as they go, the results obtained from the analysis and experiment with those of Victoria are fairly applicable to the rest of the continent. We have to consider each of the three chief constituents—nitrogen, phosphoric acid, and potash. So far as results of analysis are available, it appears that on the average our soils are as rich in nitrogen as those of Europe or America, and nitrifying processes seem to go on with such rapidity that for the most part, especially in dry areas, there is no need to add this

element to the soil in the form of artificial fertilizers. On the wheat lands the addition of nitrogen actually diminishes the yield. Where the rainfall is above 25 inches the addition of nitrogen increases the yield of grain and also the total weight of the crop, but the former effect is not so marked as the latter. For the most part the soil appears to be abundantly furnished with nitrifying bacteria; all leguminous crops flourish luxuriantly, and so far as our experiments have gone, the addition of nitrogen-fixing bacteria to the seed has had no apparent effect in assisting the crop. Considering that all animal excreta and farm-yard manure are proportionately very rich in nitrogen, it appears practicable, by good farm methods, not only to keep up, but also to rapidly increase the amount that exists on virgin land. The nitrogen problem is important, but by scientific methods it may easily be solved, and at present I think there is no indication that it will become as important as it is in Europe and America. While we are not yet able to explain all the phenomena, it appears certain that in this respect we are favoured either by the soil or the climate; nitrates seem to accumulate rapidly. For market garden crops and potatoes, especially on the lighter sandy soils, it is found that a light dressing of nitrogen, in readily available form, insures a profitable crop; but for cereals, and for ordinary fodder crops, the cost of supplying the necessary amount of nitrogen is not a serious problem to the farmer, and it appears to me that with improved farm practice, it will become even less formidable as general farming takes the place of cereals alone. The presence of lime in suitable amount facilitates the process of rendering the nitrogen available, as will be noticed later on.

THE PROBLEM OF PHOSPHORIC ACID.

Turning next to phosphoric acid, we may look upon this constituent as being, in a special sense, the controlling factor in the development of plant life. It is remarkable that the world supply of nitrogen, phosphoric acid, and lime at present available for the use of existing plants and animals has all been combined and rendered available by past generations of living things. Originally all the phosphoric acid of the soil formed part of the most ancient rocks in the form chiefly of apatite. It has gradually become concentrated on the surface of the soil by the intervention of plants and animals. Comparatively little is leached out of the soil by the rain, only the barest trace being present in sea water. In the case of rock phosphate, the seaweed growing in shallow depths has collected this trace of phosphoric acid from the sea water, just as the coral and other organisms have collected the lime. From the sea-weed the conversion into rock phosphate is accomplished through the medium of the fish and birds. We are at the present time drawing on the accumulations that have been made in past geological ages. In the case of the phosphoric acid of the soil this has been gradually accumulating in the surface layers through the medium of the plant, but its concentration is brought about through the intervention of the animal. The nearly insoluble phosphate of lime of the bones of vertebrates offers striking analogies to the similarly insoluble carbonate of lime of the shells of invertebrates.

It is often asked if there is not a certainty in the early future that such soils will become exhausted of their supply of plant food, and become unprofitable. So long as live stock are kept in considerable numbers, this is not likely to happen. I take it that Australian soils owe their small

phosphoric acid supply to the fact that the continent has never been heavily stocked by large animals of any kind. In Victoria we know that *previous to settlement by white men the* number of kangaroos and emus was much less than the number of sheep is at present. Periodical droughts reduced them in the north; vast areas were so densely timbered that there was little herbage for them to eat. There were never very many natives in Victoria, but there were quite enough to keep the large animals from becoming numerous on the open plains. Now the animal is the great factor in concentrating phosphoric acid in the surface layers of the soil. It is true that where no animals are present nearly all the components of the plant are returned to the soil by the process of decay. But the animal stimulates the plant to increased growth. As the flower shoots in particular are browsed off, fresh efforts are made to produce a new crop of seed. Hence more phosphoric acid is drawn up by the roots from the deeper layers of the soil. The animal concentrates the phosphates chiefly in the bones, and when death occurs the bones are slowly but surely incorporated in the earth. In addition, phosphates are being continually returned to the soil in the excrements. The carcass of one sheep to the acre represents the application of 2 lbs. of phosphoric acid, or about 10 lbs. of ordinary superphosphates. This quantity does not appear very large, but when the process is repeated year by year for centuries the amount steadily accumulates. As phosphoric acid becomes available in increasing quantities the growth of plants of all kinds is stimulated, and consequently more animals can be carried in a given area. Nature's methods throughout all bygone ages are precisely what every thoughtful farmer aims at imitating at the present day. Just as living plants and animals have slowly accumulated the potash and lime from the sea water till they form vast masses of dry land, so the nitrogen and phosphoric acid have been gradually made available for existing plants and animals by their predecessors throughout all the geological ages. The soils of Victoria are just beginning to be improved by animals. The transformation of the hill country which is brought about by the introduction of Merino sheep, may be studied about Alexandra or Tallangatta, where a few years have already made great changes. Judging by what has already occurred, I think we may have no misgivings for the future.

The average chemical composition of Victorian soils as taken from the preceding table bears out the inferences drawn from the examination of soils of various localities. Judged by European standards the amount of fertility is often small. When it is attempted to make an estimate of the amount of plant food in readily available form (soluble in water or citric acid solution), the results are very disappointing. Yet the practical results are precisely the opposite, and it may well be doubted if any soil in the world is more prolific. The total amount of agricultural products consumed locally and exported is valued at over £20,000,000, or an average production of nearly £400 per farm. As only one acre out of every eight of the occupied part of Victoria is at present under cultivation, the above results are achieved to a very large extent simply by grazing the natural pastures. The soils from Mildura, in the Mallee, are much below the average in phosphoric acid and nitrogen, yet under irrigation 10,000 acres support a population of 5,000, or 330 persons to the square mile. Here again development is just beginning, for with the application of more labour the returns from the irrigated land could be vastly increased. From the strictly chemical point of view, much of the wheat land appears to be in danger of early exhaustion, yet after many years of grazing and cropping

it is more valuable than ever. Similar instances could be quoted from every part of the State.

Reverting to the total weight of each ingredient present in the surface foot of each acre, it will be seen that rich soils contain in this amount of soil 3¾ tons of nitrogen, 3 tons of phosphoric acid, and 8¼ tons of potash. One of the poorest contains 1 ton of nitrogen, 6 cwt. of phosphoric acid, and 9 cwt. of potash. As a 20-bushel crop of wheat (straw and grain) removes only 35 lbs. of nitrogen, 14 of phosphoric acid, and 25 of potash, it will be seen that even poor soil contains materials for generations of cropping if the proper ingredients can only be made available. The phosphoric acid would last about 48 years. There is, however, the subsoil to draw on, and we have seen that phosphoric acid is nearly as abundant in the subsoil as in the surface. With intelligent farming there is no question but that the amount of plant food will steadily increase. The striking results produced by the application of 10 lbs. of phosphoric acid in the form of superphosphate have been already referred to. Such a small amount cannot perceptibly increase the total per acre. At the most, it can only give the young plants a good start, because from what we know of the residual effects of such applications, it is fairly certain that the whole of the added phosphoric acid is not absorbed by the growing crop. There must, therefore, be certain changes going on in the soil during the growth of the crop which rapidly render the latent plant food available. What these are we are not in a position at present to state precisely. The marvellous growth that occurs everywhere when the rain comes after a dry spell shows that there are forces at work during the months of bright sunshine which are very friendly to the husbandman. The fact that applications of nitrogen actually reduce the yield in the northern plains confirms this view. Many acres of the poor sandy soils within 20 miles of Melbourne are bought and sold at from £20 to £40 per acre, after they have been under cultivation for a few years, and where such improvement is daily taking place it is certain that it will follow on the same methods being applied to more remote districts as population increases. The absence of land animals accounts at once for the luxuriance of our primæval forests and the scarcity of phosphoric acid on the surface of the soil. Had the herbivora been well represented in the past they would have destroyed the young trees and at the same time have concentrated the plant food. The existence of dense forests proves that Victoria contains no barren land, for soil that will produce such trees will most assuredly produce a bounteous harvest when its forces are controlled by the intelligence of man.

With regard to the relatively large amounts of potash and lime in the northern soils in Victoria, these substances have been shown to have a very important influence in a number of ways. First of all they favour the growth of micro-organisms in the surface soil, and in this way lead to the rapid oxidization of organic matter, and the consequent formation of humus. They have, therefore, a direct effect in rendering both the nitrogen and phosphoric acid more readily available for the plants. A soil well supplied with humus is in the best possible condition for maintaining a proper amount of moisture in readily available form in its superficial layers, and hence it follows that soils well supplied with lime and potash are, in proportion to their rainfall, in a good position to have practically the whole of the moisture available for the plants. In the coastal districts where the rainfall is heavier, and consequently the amount of soluble

material which is washed away in the course of each year is considerably greater, we find that the amounts of both phosphoric acid and potash are such that the addition of both these substances gives profitable results. In addition to this the rainfall is sufficiently heavy to allow the plant to make use profitably of a larger percentage of nitrogen in readily available form, and hence it follows that the addition of nitrates or ammonia salts causes a large increase in the yields.

Markets for Australian Produce.

Turning next to the question of the disposal of the agricultural products raised in Australia, several points challenge attention. The first is that during the last half century there has been a steady increase in the consumption per head of food stuffs by the great mass of the population of most civilized countries. A trifling increase each year means an immense expansion in the total amount. While production has been advancing very rapidly, consumption has been advancing at an accelerated rate, and what has happened in the case of European communities will probably also follow in the case of the Eastern nations. It need hardly be pointed out that a slight change in the dietary of these nations, which constitute one-half the population of the earth, must have a profound influence on the demand for any given article of diet. Speaking broadly, I think there is no doubt that wheat and wheat products, animal food and animal products, are steadily displacing less nutritious articles of food all the world over. While the demand for agricultural products, such as those which form the staple industries of Australia, is likely to increase, we have only to turn to the importations into Great Britain over a series of years to see the market—practically unlimited in extent—which is open for us to exploit, and of which up to the present moment we have only touched one or two lines. The following table shows the average value of importations into Great Britain in millions sterling during each of the last six years. The total amounts to £224,000,000. Of these items, Australia contributes a large proportion of the wool, a fair amount of the hides, horn, and tallow, and a small percentage of wheat, dead meat, butter, and rabbits. Of the £224,000,000, our annual contribution has averaged £20,000,000.

Value of Importations into Great Britain in Millions Sterling.

(Average of last six years.)

Wheat, Flour	... 38	Fruits and Vegetables ...	... 14
Dead Meat	.. 38	Live Animals for Food ...	... 10
Butter, Cheese, Milk ...	... 31	Cattle and Horse Food ..	.. 9
Other Grains and Meal ..	... 25	Hides, Horns, Tallow ..	... 6
Sugar and Farinaceous Foods	... 25	Rabbits, Poultry, Eggs ...	... 4
Wool	... 24		
		Total ...	... 224

As will be seen a little later on, I look upon the steady extension of the area of cultivated land as being essential for the continued expansion of our agricultural industries. Wheat is the crop which lends itself most favorably to Australian requirements and conditions. As will be seen from the following table, Australian exports have only on one occasion reached 10 per cent. of the total amount of wheat consumed in Great Britain in any single year, and it is clear from the following tables that every effort must be made to increase the wheat yield of Australia if we are to make a substantial advance in this direction, especially in view of the enormous strides that have been made in recent years by the Argentine

Republic both with regard to the amount of wheat shipped to Great Britain and also with regard to the total area placed under cultivation.

IMPORTS OF WHEAT AND FLOUR INTO GREAT BRITAIN.
(Percentage from each Country.)

—	1900	1901	1902	1903	1904	1905
Argentina	19	8·2	4·2	12·2	18·5	21·1
Russia	4·6	2·5	6·1	14·8	20·1	21·8
United States	58·2	66·2	60·2	40	15·7	12·7
Other Foreign Countries .	5·9	3·8	5·9	6	6·5	6·7
Total Foreign	87·7	80·7	76·4	73·	60·8	62·3
Australia	3	6·9	3·9	—	9·6	10·1
Canada	8·1	8·7	11·3	12·4	7·6	7·3
India	—	3·3	8·2	14·6	21·6	20
Other British States	1·2	1·4	·2	—	·4	·3
Total British grown ...	12·3	19·3	23·6	27	39·2	37·7

CULTIVATION OF WHEAT IN MILLIONS OF ACRES.
(Averages for past twenty-five years.)

—	1881–5	1891–5	1901	1905
Argentina	0·6	5	8·3	12·1
United States	37	36·4	49	48
Canada	2·4	2·7	4·2	6
Australasia	3·6	4	5.9	6.5

What, then, are the main points which have to be kept in view in order to keep Australia advancing in the van of agricultural progress? The first thing is the utilization to the utmost of the rainfall. We have pushed the limit of cultivation, experimentally at least, up to the fringe of the arid region, and farmers are tempted to chance a crop of wheat year after year in spite of the probabilities of failure, simply because the cost of growing and harvesting the crop is so small that a good year means a handsome profit. The average yield of wheat in Australia is very low; but it must be remembered that in no part of the world is the cost of growing it lower per acre, and nowhere is a crop produced on such a low rainfall. Nearly all the wheat grown in Victoria is produced in the driest part of the State, very little of it receives more than 20 inches of rain, and there is no doubt that the limit of profitable production throughout Australia will gradually be advanced to the 10-inch line of rainfall.

THE FUTURE OF AGRICULTURAL PRACTICE.

The future of agricultural practice in all parts of Australia must depend for its success on the judicious combination of animal husbandry with increased areas under cultivation. We have already seen the fundamental principles which are involved in this combination, and also the extent to which both are dependent on the proper use of the available water supply.

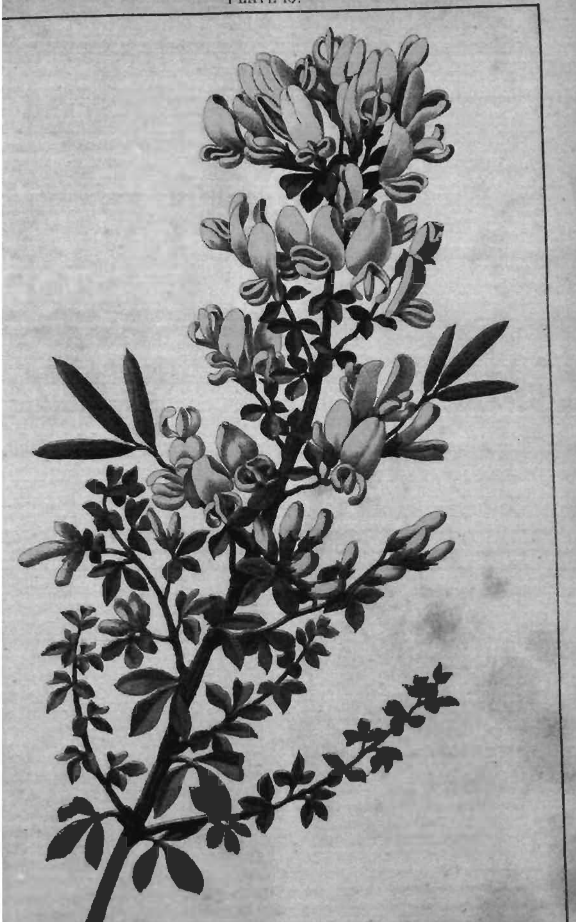
The details of the ways by which these objects can best be attained vary in every district. It is the skilful use of his opportunities that makes the successful farmer. But a number of points are so important that they each require a few words.

1. *Irrigation.*—The population of Australia is at present too scanty to allow us to do anything more than play at irrigation, because successful irrigation means small holdings and comparatively intense culture. All irrigated land should carry the equivalent of one cow to the acre, and to superintend this amount of production—whatever may be the form it may take—means the utilization of a far greater amount of labour than is at present available in Australia. The area capable of irrigation is so vast that it must always be one of the chief factors in the agricultural development of Australia. It is estimated that the Murray and its tributaries alone will supply water for 8 million acres of land. In addition, it may be said that in the regions where the rainfall is above 30 inches sufficient water now runs uselessly into the sea from each square mile to irrigate another 40 acres. The success which has already been achieved in different parts of Victoria by using this water to form a small private irrigation scheme indicates the immense possibilities in this direction. The most practical way to promote closer settlement is by establishing irrigation colonies for dairy farming. Forty acres of land under lucerne and maize on the banks of the Murray would thus easily keep a family in affluence.

2. *Improvement in Dry Farming Methods.*—The best way to carry out the fallowing, and the right amount of superphosphate to use, are points about which we are obtaining more information from year to year. At the same time, the question of the most suitable variety of wheat and the growth of green fodder crops for sheep is engaging the attention of all progressive men. Australian wheat is grown with a lower average rainfall, and at a lower cost per bushel, than that of any other country of the world. At the same time, more importance needs to be attached to the growth of deep-rooted and leguminous plants, and to the rotation of crops. It is here that sheep worked in with the wheat is a financial success. Lucerne, rape, peas, clovers, oats, and barley are types of the crops that wherever possible should be grown along with wheat. They are not to be sold in the market, but to be fed to sheep and cattle, and the profit will come from the formation of humus, and the consequent steady increase in the fertility of the land. Lucerne stands unrivalled as a summer crop, the others are brought to maturity by the winter rains alone. Then, again, the sheep conduce to clean farming, grazing off the early wheat, and prevent the wild oats from seeding. In every way the crops keep the sheep and the sheep keep the crops. The extension of lucerne and rape into the drier areas, and the introduction of allied plants that can be grown with even less rainfall, are two of our most pressing problems.

3. *Conservation of Fodder.*—In all parts of Australia certain months are marked by the luxuriance of the herbage, of which the live stock are unable to consume more than a small fraction. The monsoon rains cause a growth that appears almost incredible in the warmer parts of the continent while the spring growth is often of the same character in the southern States. Here, again, we want labour to make it practicable, but, given labour as efficient as that which raises our wheat crop, and the possibilities in the direction of hay and silage are immense. The surplus of a good season might then be carried forward to meet a time of drought.

PLATE 10.



CAPE BROOM

4. *Improvement of Poor Soils.*—The use of superphosphates and the adoption of some such system of rotation as oats, peas, rape, barley or wheat, most of the produce to be fed to live stock on the farm, will at once start a man on the up-grade. Grass land top-dressed with superphosphate or bonedust will rapidly increase in stock-carrying capacity.

CONCLUSION.

But suppose our present bright prospects of profitable markets disappear, there is no question but that with our present small population over production would ensue, and much of our existing industrial buoyancy would disappear also. But the farm, as a home, would remain, and would offer even a better field for well-directed energy. Under such circumstances, in comparison with trade and manufacture it is probable that agriculture would be more highly thought of than it is in periods of prosperity. Its attractions to the most progressive units in the population would be greater than ever. There is the old saying that the farmer is the most independent of men. The endless modification of the details of successful farm practice offers ample scope for every one to develop along his own special line. He may vary the purposes for which he uses his land and still be quite as successful as his neighbours. If enthusiastic at his work he may follow his bent to its full scope and still be successful. It makes no difference whether he specializes in crops or animals or simply holds to all-round farming. There is the life-long satisfaction of feeling that you are making progress from year to year. That next season you will make the poorer part of your land a step nearer to the best. That you will weed out the least profitable of your live stock and replace them with something better than your best. That after you have weathered one bad year you will be in a stronger position to meet another. In a word, it is the privilege of the farmer to know that his future is more in his own hands than is the lot of most other men. That if he keep on sound lines Nature will be true to him, and that his upward progress, though it may be slow, is not the less certain to be sure.

THE PROCLAIMED PLANTS OF VICTORIA.

(*Continued from page* 104.)

Alfred J. Ewart, D.Sc., Ph.D., F.L.S., Government Botanist; and J. R. Tovey, Herbarium Assistant.

Cape Broom.

Cytisus canariensis, *Steudel* (*Leguminosæ*).

A hardy evergreen shrub, 4 to 10 feet high. Branches angular; leaves, with three leaflets, and, as well as the branches, clothed with soft hair or down, leaflets obovate-oblong. Heads of flowers, terminal, yellow, pod clothed with white hair. A native of the Canary Islands. It should be dug up before flowering, and, being perennial, the root, as well as the stem, should be removed. Proclaimed for the Shires of Creswick, Glenlyon, Heidelberg, Kyneton, Kilmore, Lilydale, Lexton, Malmsbury, and Springfield.

IMPROVEMENT IN HORSE-BREEDING.

ACTION BY VICTORIAN GOVERNMENT.

REPORT BY MR. S. O. WOOD, V.S., ON HIS MISSION TO EUROPE.

With a desire to furnish some practical means of arresting the generally recognised deterioration in the horse-breeding industry, the Honorable the Treasurer, towards the end of 1905, allotted the sum of £3,000 as a grant to be devoted to the improvement of horse-breeding. Subsequent to a conference between the Minister of Agriculture (Honorable Geo. Swinburne) and representative horse-breeders, a committee was appointed, consisting of Mr. Robert Clark, Mr. W. J. H. Campbell, the Director of Agriculture (Dr. Cherry), the Chief Veterinary Officer (Mr. S. S. Cameron, M.R.C.V.S.), and the Chief Inspector of Stock (Mr. J. R. Weir), to advise the Government as to the best means of applying the grant.

As a basis of discussion for the Committee, the following outline of three schemes was prepared by the departmental officers:—

I. FREE GOVERNMENT CERTIFICATION OF STALLIONS STANDING FOR PUBLIC USE—

1. The Government to undertake to have all stallions standing for the use of public examined for soundness, free of cost, by qualified veterinary surgeons selected for the purpose.

2. The examinations to be conducted at certain advertised centres in each district throughout the State during the months of June, July, August, and September in each year.

3. The examining veterinary surgeons to report to the Department, and, in the case of stallions to be certified, the official Department of Agriculture certificate of soundness to be issued within fourteen days of the examination.

4. Certificates of soundness to be issued in the case of all stallions not found to be affected with hereditary unsoundness. Unsoundness the result of work or accident, and blemishes not liable to be transmitted, are not to disqualify.

5. A condition of the Government grant to Agricultural Societies in the future to be that none but certified stallions shall be awarded prizes in breeding classes.

II. INSTITUTION OF DISTRICT PREMIUMS FOR STALLIONS—

A. 1. For stallion premium purposes the State to be divided into (say) fifteen districts.

2. In each of these districts a parade of stallions to be held on a date to be fixed during the month of July or August, at which all stallions entered for competition will be judged by a committee of three expert judges appointed by the Government.

3. The first prize-winner in each district (or possibly, in the case of large districts, the two first) to be awarded a premium of £200 on the following conditions:—

a. That the premium stallion be travelled through the district according to an agreed route and fixed daily time-table.

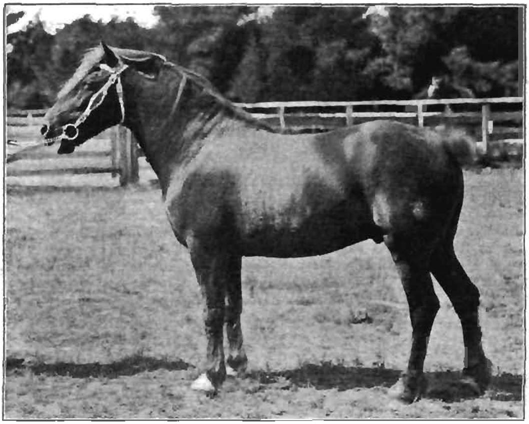
b. That the services of the premium stallion be made available for the service of at least 60 mares (the *bonâ fide* property of farmers whose

freehold or leasehold property is valued at less than £2,500) for a fee of £2 per single mare, £3 10s. per pair, or £1 10s. for three or more mares.

B.—ALTERNATIVE PREMIUM SCHEME—

1. As in A (1), but providing twenty districts.

2. The districts to be selected from amongst those from which applications are received from the local Agricultural Societies offering to supplement by the sum of £50 a Government grant of £150, so as to make a premium of £200, to be awarded as in A (2), except that the judges be nominated by the Agricultural Societies concerned, with a Government representative as veterinary referee. (N.B.—In this scheme a committee



A TYPICAL WELSH COB.

Selected by Mr. S. O. Wood, and imported by Mr. O'Keefe, "Barholm," Oakleigh.

of farmers subscribing the amount of £50 might take the place of the Agricultural Society.)

III. PURCHASE OF STALLIONS FOR LEASING—

1. Six stallions (or more) to be purchased at an average cost of £500.

2. During the off season these stallions to be kept at some existing Government institution, say Dookie College.

3. Stallions to be leased for the season (1st August to 31st December) to a farmer nominated by the Agricultural Society of a district on the following terms:—

a. That the lessee have the free use of the stallion for mares his own *boná fide* property.

b. That the lessee be allowed to stand and travel the stallion for the use of not more than 60 mares the property of farmers (whose property is valued at less than £2,500) at a maximum fee of £2 per single mare, £3 10s. per pair, and £1 10s. each for three or more mares (or £1 10s. per single mare, £2 10s. for each of two, and £1 5s. for each of three or more).

c. That the lessee effects an insurance on the stallion for the period of the lease and pays the premium thereon.

d. That the lessee gives an approved guarantee (or is guaranteed by the Agricultural Society nominating him) for the safe keeping and proper care of the stallion while in his possession, and for re-delivery of it to the Government on the termination of the lease in satisfactory condition and health. (The judge of condition and health in this case to be the Government Veterinarian.)

N.B.—A modification of this scheme, which would provide a fund for the keep of the stallions during the idle season, and for the purchase of other stallions, would be to lease for a guaranteed payment to the Government of the service-fees of, say, 25 mares at £2 each, and allow service of, say, 50 other mares, whether belonging to the lessee or the public, *stipulating in the latter case that the service-fee should not exceed £2.*

COMMENTS ON SCHEMES.—These schemes may be adopted separately, or two or more of them may be carried out simultaneously.

No. 1 scheme should in any case be adopted.

No. 2 can only be adopted with success if the grant is to be continued annually. The giving of premiums for one year only would be merely a *flash in the pan, and would not result in much permanent good.* The results would scarcely be observable—would certainly not be observable to an extent sufficient to judge of the success or failure of the scheme, or of the advisability and profitableness of continuing it.

No. 3 is more suitable for adoption if the grant is an isolated one and its continuance problematical. The effect of the scheme would, of course, not be so wide-reaching as under No. 2; but it has the advantage that it could be extended at any time as funds were made available, and, on the other hand, it could be dropped at any time without appreciable loss in case it was judged to have failed.

REPORT OF COMMITTEE.—The Committee, in its report, expressed the opinion that £3,000 was too small a sum to make a profitable commencement along any line of policy, and that it might be well to defer action until the amount could be increased to £8,000 or £10,000. Alternatively, the Committee recommended—

1. That the £3,000 be expended on only one scheme.

2. That scheme No. 3 be adopted, providing for leasing Government stallions to persons approved by Agricultural Societies.

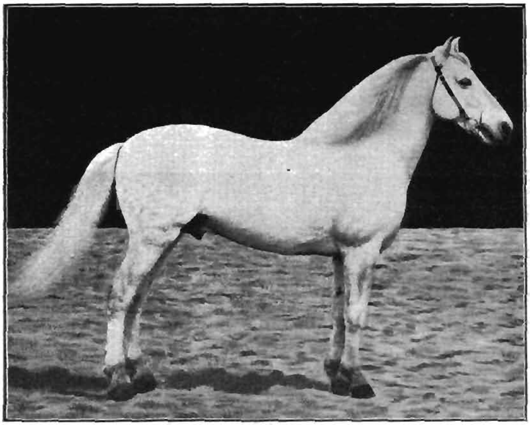
3. That for the current year a number of Welsh pony stallions be imported, and, in addition, from four to six mares of the same breed. Stallions to be leased in accordance with scheme No. 3, and the mares kept at Dookie, or other suitable centre, in order to form the nucleus of a pedigree stud of this breed.

It will probably be necessary to send a man to England to purchase these horses.

After further conference with representative horse-breeders and others interested in the trade, the Minister decided to spend the vote as recommended by the Committee.

On the announcement of the definite intention of the Government to import a number of Welsh cob stallions and mares, much public interest was manifested, and a considerable amount of criticism proffered through the press. The various views thus put forward were commented on in the following memorandum to the Minister by Mr. S. S. Cameron, M.R.C.V.S., Chief Veterinary Officer, on 21st March, 1906:—

"The scheme for utilization of the Government grant of £3,000 towards the improvement of horse-breeding, which was formulated by the Committee appointed by the Honorable the Minister, namely, the importation of a number of Welsh cob entires and mares, has now been before



IMPORTED WELSH PONY, "MOUNTAIN HERO."

Property of the late Hon. J. H. Connor, M.L.C. Champion prize-taker of Australia.

the public three months. The scheme has been criticised from all quarters, and, in the main, it may be said that the amount of adverse criticism has not been so great as the Committee expected. The subject is one on which all sorts of opinions are held, and it is safe to say that there is not likely to be unanimity, even amongst experienced men, as to the best means of attaining the object. It is noticeable throughout all adverse criticism that it is of a destructive character, and not constructive. That is to say, while in some quarters the scheme has been broadly condemned, no better way of expending the money has been put forward. Indeed, nothing has been suggested in this connexion but what had previously received careful consideration by the Committee before deciding on its recommendation. On the other hand, the support which the scheme has received is gratifying,

and the weight of opinion in its favour preponderates largely over that against. For instance, of some 44 correspondents to the *Argus* newspaper, 24 expressed themselves as in favour of the Government scheme, twelve others were opposed to the scheme, and eight were neutral on the point. It is true that of these same correspondents three only favoured the use of Welsh pony stallions direct for the breeding of Indian remounts; but it must be remembered that the object of the Government scheme is rather to add weight and bone to the present type of mares, in order that the progeny, on being put to a thoroughbred, may get the animal suitable for the Indian trade. Again, decided opinions in favour of the scheme have been expressed at meetings in different parts of the country, and notably at a meeting at Nhill, at which the favorable opinion was embodied in the form of a resolution.

A number of applications have already been received by the Department for the hire of the stallions when available. These applications have been from individuals, and also from Agricultural Societies and other bodies. It should be remembered that the object aimed at in this scheme is to establish a stallion-breeding stud which would produce animals continuously for leasing purposes. In regard to thoroughbreds and Clydesdales, this object is being attained by private enterprise, and it is questionable whether the Government could in any way improve matters by adopting these breeds. While it is admitted that the Arab stallion is very suitable for the purpose desired, it is not feasible for the Government to establish an Arab stud that would make Arab stallions continuously available, the reason being that under the present conditions it is practically impossible to obtain pure Arab mares. Therefore, if a continuous scheme of leasing is to be carried on, a continuous scheme of purchase of stallions would be necessary. Given that the selection and the purchase is placed in reliable hands, the scheme for the importation of stallion cobs still stands as the most feasible method for the utilization of the grant."

At this stage Mr. S. O. Wood, V.S., who was about to leave on a visit to Europe, intimated his willingness to act in an honorary capacity for the Government while in England in the matter of selecting the animals required, and his services were accepted.

The exact scope of Mr. Wood's mission will be best gathered from the appended extracts from his letter of commission:—

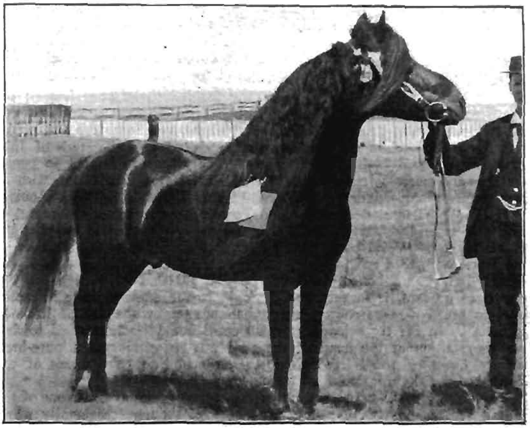
"Having reference to your offer to assist the Government of this State in the matter of the selection in England of a number of stallions and mares for importation here, I beg to inform you that the Government has accepted your services in this regard, and I have now the honour to submit to you the following suggestions for your guidance and instruction:—

"That the sum of money to be expended in purchasing should not exceed £2,400 or thereabouts, so that a balance of £600 out of the £3,000 made available by the Honorable the Treasurer may be kept to meet the expenses of purchase, shipment, and insurance.

"That your attention should be directed in the first instance to the carrying out of the scheme advised by the Committee on Horse-breeding, and assented to conditionally by the Cabinet, viz.:—The purchase of animals of the Welsh cob breed, 14 hands high (or thereabouts) and upwards, of stout build, vigorous, with good action and quality, all even in type (and, if possible, colour), so that they may form the nucleus of a standard and typical stud capable of ultimately effecting the object the

Government has in view, viz.:—The infusion amongst Victorian studs of horses suitable for the getting of Indian remounts, artillery horses, and stout light horses, either directly or through their progeny when mated with the light-boned mares of thoroughbred descent which you are aware of as being common throughout the State. In this connexion, it is thought that you will agree that in the cases of two or three animals out of the lot close-blood relationship will not be an objectionable feature if animals, outbred to one another, of suitable type cannot be secured in sufficient numbers.

"That for the sum named (£2,400) it is thought that six entires and a like number of mares may be secured; the entires at an average of about £300 each, and the mares at about £100. It is, however, recognised



WELSH PONY, "BRIGHAM YOUNG."

Property of the late Hon. J. H. Connor, M.L.C. Winner of forty First and Grand Champion prizes.

that in this regard your own judgment will have to be largely depended on, and considerable departures from the averages named may have to be made in order, perhaps, to secure suitable animals; and it may be that only a lesser number of each or either can be secured for the amount, but, on the whole, it is thought that the average amounts and number named should be adhered to as closely as possible.

"That perhaps the most advisable procedure will be for you, after arrival in England, to take a general survey of the position as regards the Welsh cob breed by visiting shows, stud farms, and the like, so as to satisfy yourself (or otherwise) that the project can be carried out in its entirety; that is, that the required number of animals of suitable and even type can be secured, and also so that you may note the whereabouts and other

particulars regarding any animals you see which are suitable for purchase subsequently.

"On coming to a decision on the points mentioned in the previous paragraph, you are requested to advise me by cable of your decision and recommendation."

Mr. Wood's Report.

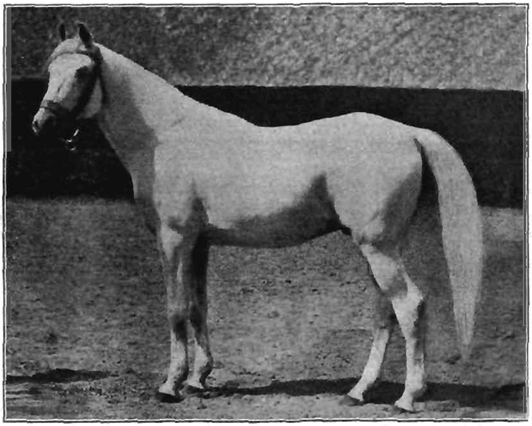
On my arrival in England on the 13th June, 1906, I at once called upon the Agent-General, the Hon. J. W. Taverner, who had been made acquainted with the object of my mission, and who at once volunteered to assist me in any direction possible.

As some of the leading horse shows of Britain, such as the Royal Horse Show at Richmond and the Royal Agricultural Show at Derby, were being held, I attended them in order to inspect and obtain any information concerning the class of horses likely to be secured to suit the State's requirements. I was disappointed to find that there was not a class provided on the prize list at either of these respective shows for the Welsh cob, 14 hands or over, and I therefore decided to at once inspect the Welsh cob studs of England and Wales. I accordingly sought out and visited every Welsh cob stud and farm which I could hear of where ponies were likely to be obtained. Amongst those visited were the studs of John Jones, of Denarth Hall, Colwyn Hay, where I inspected some 70 ponies (stallions and mares); Jones, of Manoravin Stud Farm, Llanfyllin, with 40 to 50 ponies; John Dugdale, Llenyn Stud Farm, Llanfyllin, with 30 ponies; J. H. Day's celebrated Hackney and Pony Stud, Crewe, and I regret to state that after inspecting all the stud farms, it appeared to me that the original type of Welsh pony known to or had in mind by the breeders of this State, had, to a great extent, disappeared. The practical loss of the strongly-built, stout-boned, nuggety type of Welsh cob, such as it was desired to procure, is largely due, I think, to the attempt made in recent years to breed a more showy and stylish animal by the use of hackney stallions. In the three leading Welsh cob studs I was surprised to find that the stallion at the head of the stud was in every case a pure-bred hackney horse or pony. These are being mated to pony mares of the Welsh breed from 12.3 to 13.3 hands high.

The only true Welsh cob stallion of the old type seen by me in one of the leading Welsh cob studs was 21 years of age, though occasionally while travelling through the country I met with a Welsh pony of the original type, which, on inspection, would be found to be upwards of 20 years old. I could not help being struck with the pity of it all—the sacrifice of the substance, strength, and hardiness of the old sorts for what I feel sure is merely a passing craze—for, provided that animals of this type, about 4 or 5 years of age, could now be secured, they would be of great value to any country, and could scarcely fail to produce a serviceable and saleable animal when mated with almost any class of mares. The more thoughtful of the Welsh breeders with whom I discussed the subject are in agreement that the infusion of hackney blood will turn out to be a regrettable mistake, but they plead the necessity of catering for the present demand, however ephemeral it may be. The breed seems to have been allowed to almost pass away, too, without the breeders knowing of it; but it may be that the attention which was directed to the subject by my visit and my failure to get what this Government wanted will result in successful efforts at resuscitation of the breed, for on realizing the position of

affairs through driving me on many fruitless journeys, one of the principal breeders decided on the purchase of an ancient stallion or two with which to attempt a recovery forthwith.

I persevered in the hunt until the holding of the leading horse show in Wales at Aberistwyth, where I was again disappointed at the lack of old Welsh type in the winners. I also placed myself in the hands of three or four well-known agents in Wales, and got them to scour the country in search of what was wanted, but without avail. By this time the conclusion was forced upon me that it would be impossible to secure the number of stallions and mares (six of each) of this class that I was authorized to purchase. I accordingly advised you by cable, through the Agent-General, to this effect, and the following reply was received by the Agent-General:—"Alter Wood's commission to purchase five or more good-boned, substantial, thickset, thoroughbred stallions, 15 to 15.2, good whole colours, even type, irrespective racing records."



WHITE ARAB PONY "THE BUGLER."
Property of Dr. Spooner Hart.

The Dublin Horse Show was being held immediately after receipt of cable, and I spent the first week of my search through Ireland for thoroughbreds of the type indicated at the show. I then visited various thoroughbred studs at Waterford, The Curragh, Clonmell, and other centres, examining about 50 thoroughbred sires, but finding nothing suitable of the stamp required.

I returned to London and obtained particulars from the International Horse Agency (Allison's) and Messrs. Weatherby and Son, as to horses likely to be obtainable, and inspected some 50 to 60 stallions described as suitable. I next spent several days at the leading racing centres, such as

Newmarket, Doncaster, Ascot, and attended the principal blood stock sales, only to find that the class of horse required was scarcely obtainable. I found that the purchase of blood stallions 15 to 15.2 hands high, with 8 inches of bone, was almost an impossibility at any price within reason, owing to the foreign buyers being prepared to give fancy prices for this class of horse, prices far in excess of that for which the same class of horse can be purchased here in Australia. Furthermore, there are not many of the stamp to be got at any price, for the English blood horse, as a rule, stands 16 hands high or over nowadays. The foreign buyer has agents almost everywhere, who get on the track of any suitable horse immediately it is for sale. They give £2,000 or £3,000 for a good fashionably-bred horse that has broken down. Many of these horses are bought by the German Government for re-sale to breeders. The sales are effected at auction, the horses realizing perhaps less than one-half their cost in England, but they are sold on condition that the Government has first call on their progeny at a fixed price.

Having been disappointed in the effort to obtain the stamp of thoroughbred stipulated, I cabled you on September 22nd as follows:—"Stout-boned thoroughbreds, 15 hands to 15.2 unobtainable. Are you prepared to take horses stout-boned up to 16 hands?" to which I received the reply, "No: if commission cannot be carried out, abandon." and I cannot help but think that this decision was a wise one, for I feel sure that, apart from the advantage to be gained by the introduction of fresh lines of blood, as well may be done by purchasing thoroughbreds in Australia—the type of horse that the Indian and the Japanese Governments have been buying from us for some years back.

It is, nevertheless, very disappointing to me to have to report failure to execute your desires, but it will always be a satisfactory reflection of mine that I refrained from incurring an expenditure that I could not have well justified, and that could only have had results short of what was anticipated.

The time occupied, and the extent of the country covered, in my journeyings will be gleaned from a reference to the subjoined list of some of the places visited by me while engaged in attempting to carry out your commission:—

The Royal Horse Show, Richmond.
The Royal Agricultural Show, Derby.
Mr. J. Jones, Colwyn Bay.
Liverpool.
Crewes and Chester.
Llanfyllin (Dugdale's Stud).
Bettas-y-Coed Stud.
Mount Snowden (herds of mountain ponies).
Wrexham.
Welshpool.
Llanfair.
Garthmyl, Montgomeryshire.
Llandella (Jones's Manoravon Stud).
Cardiganshire.
Pembrokeshire (Bristol).
Elsenham Hall (Sir Walter Gibney's Hackney and Welsh Cob Stud).
Perth Pony Sale.
Dumfries.
Aberwyth Horse Show.
Tragaron.
Macknllith.
Montgomery.
Buxton (Sir Gilbert Greenhill's Stud).
Dublin Horse Show.
Clonmell Thoroughbred Studs.
The Curragh Thoroughbred Studs.
Waterford.
Newmarket Blood Stock Sales.
Ascot Blood Stock Sales.
Doncaster Blood Stock Sales.

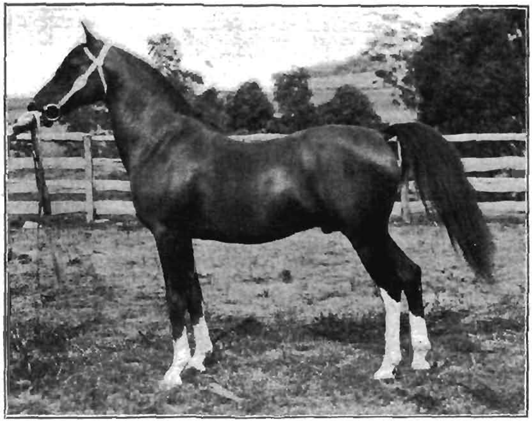
EFFORTS AT IMPROVEMENT IN ENGLAND.

The deterioration of the English army horse is exercising the minds of the English Government to such an extent that at the present there is a Commission sitting with respect to the question. The plan at present in operation in England to encourage the improvement in horse-breeding is the awarding of King's premiums for competition amongst thoroughbred horses, arranged by the Royal Commission on Horse-breeding, under the following conditions:—

KING'S PREMIUMS.

Twenty-eight "King's Premiums," of £150 each, are offered for thoroughbred stallions between 4 years old and not exceeding 20 years old.

It shall be a condition that each stallion winning a premium shall serve not less than 50 half-bred mares, if required, during the season, and shall



A DESERT-BORN ARAB.
Property of Dr. Spooner Hart.

stand or travel, as the Commissioners may direct, in the district for which he is exhibited, at a fee not exceeding 4s. for each mare, and 2s. 6d. to the groom.

The season will commence on April 2nd, and terminate on July 31st.

It shall be a condition that no King's Premium stallion shall be allowed to be exhibited *for competition* during the season of service.

It shall be a condition that a stallion which has won four Queen's or King's Premiums in the same district class shall be ineligible for entry again in the same class, but shall be eligible for any other district class.

For the purpose of this exhibition, each district will constitute a separate class, to be styled "District Class."

Stallions shall compete *only* in the "District Class" for which they are entered, and exhibitors may not enter more than one stallion in each class.

The Commissioners reserve power to award to a stallion unsuccessful in the district class for which he is entered a premium in the class of any other district *provided* the exhibitor enters the stallion on these terms. Should a premium be awarded in such other class, the obligations as to location and service shall apply to the district for which the premium is awarded, instead of the district for which the stallion is exhibited.

The Commissioners are of opinion that the following diseases shall disqualify a thoroughbred stallion for the purposes of this Commission, viz.:—

Roaring—Whistling.	Navicular Disease.
Ringbone.	Spavin (Bone).
Unsound Feet.	Cataract.

If any stallion winning a premium should not serve at least 30 half-bred mares during the season, the Commissioners reserve the power to reduce the premium, as provided by the rules and regulations.

The 23 premiums are distributed over 12 groups of counties in England and Scotland; two groups having four premium stallions allotted, five other groups three stallions, and the remaining five groups one stallion each. I have a copy of the regulations governing the awarding of the premiums, which I will be pleased to make available at any time.

CONTINENTAL METHODS OF HORSE CULTURE.

In order to learn what is being done by other countries for the improvement in breeding of pure stock, I visited France, and there inspected M. Blanc's stud; also the National Stud, at Le Pin Normandy, the latter being one of the Government stud stations. Here I had the pleasure of seeing 300 stallions, comprising thoroughbreds, half-bred Normans, Venerdens, qualified trotters, English hackneys, draught sires, Percherons, Boulonnais. The horse now being bred by the French Government for general utility purpose is the Norman horse. This is a distinct type produced by the French after 60 years of careful breeding on practical lines, and can be depended upon to breed true to type. He is a class of horse between the thoroughbred and draught, showing plenty of pace and action.

The methods adopted by France can be realized somewhat from the following facts, which I obtained from personal inspection and inquiry and from perusal of Sir Walter Gilbey's notes on "Horse-breeding in France."

It being the object of the Government to foster and encourage the breeding of horses of classes most useful to the people of the country, there is in every public stud considerable variety of breed, and therefore the owner of a mare may exercise his own judgment in selection of a sire. The turf in France has always been made subservient to the serious national work of breeding useful horses. Public money is not spent in encouraging weeds only capable of carrying six or seven stones over a five-furlong course.

Under the law of the 29th March, 1874, the horse-breeding establishments of France were re-organized. It was then enacted that the State should purchase stallions at the rate of 200 per year, until a total of 2,500 had been reached. In 1892, other legislation was passed sanctioning a

further increase in the number of State stallions by annual additions to the number of 50. Finally, in 1900, a third enactment authorized the purchase of 50 stallions a year until the number owned by the State should reach a gross total of 3,450.

France, for stud purposes, is divided into six districts, which contain 22 Government studs for stallions. At these studs, on the 1st January, 1905, 3,267 stallions of different breeds were available for distribution among 689 local covering stations for the public service.

The stallions are divided into three classes, and the strength of the studs at the beginning of 1905 was as follows:—

Thoroughbreds—	
Thoroughbreds	244
Arabs	102
Anglo-Arabs	233
Not Thoroughbreds—	
Southern Half-breds	200
Normans and Vendeans	1,451
Qualified Trotters	307
English Hackneys	120
English Hackney (Cross-breds)	74
Draught—	
Percherons	301
Boulonnais	71
Ardennes	98
Bretons	66
	3,267

The service charged to owners for these stallions varies from a minimum of 5s. to 16s. per mare.

During the year 1904, there were 3,213 stallions belonging to the State in actual work. These covered 175,956 mares. Looking more closely into the returns of service, it is found that in the thoroughbred class (English, Arab, and Anglo-Arab), 583 stallions performed 25,577 services, or about 44 each; the half-bred class, 109,271 services, or nearly 52 each; and the draught sires, 41,108, or over 79 each. The stallions at each local covering station are changed frequently.

Besides the 3,213 stallions belonging to the State, there is a large number in the hands of private owners. Any stallion whose services are available to the public must be licensed by the Government as belonging to one of these classes:—

1. "APPROVED" stallions, which are considered good enough to improve the breed of horses. These are sub-divided into two classes. Sires which can earn over 100 francs (£4) per service constitute the first class; these receive no bounty from the State. The second class consists of sires, for whose services less than 100 francs is charged by the owner; these receive an annual premium of from £12 to £80 a year. In 1904 there were 1,479 approved stallions, viz.:—

Thoroughbreds, Arabs and Anglo-Arab ...	306
Not Thoroughbred	459
Draught	715
	1,479

2. "AUTHORISED" stallions, which receive no premium, but whose progeny are eligible to compete at shows subsidized by the State. There were licensed of these in 1904:—

Thoroughbrds, Arabs and Anglo-Arab ...	23
Not Thoroughbreds	28
Draught	202
	253

3. "ACCEPTED" stallions, which have nothing to recommend them but a certificate of freedom from roaring and intermittent ophthalmia. In 1904, 7,629 stallions were "accepted" by the Committees charged with the duties of examination.

During the same year, the "approved" stallions performed 75,717 services, and the "authorized" stallions 11,945. No record is kept of the covering by the third class, or "accepted" stallions.

STUD FARM.—There is only one Government Stud Farm, and this is at Pompadour, where 60 mares are kept. English thoroughbred, Arab and Anglo-Arab, horses are bred at Pompadour, and the farm is only a small factor in the general scheme of breeding. Improvement is sought principally through the provision of good stallions.

Bounties are also given for brood mares, filly foals, and a prize for horse-breaking at public competitions. These measures encourage owners to retain possession of the best breeding stock for the benefit of the nation, and stimulate endeavour among the people to achieve skill as horse masters.

About £308,000 of public money is spent annually in France in horse breeding. The expenditure includes the maintenance of the stallion studs and depôts, purchase of horses, premiums to private stallion owners, prizes given at races and local shows, &c. About £100,000 of this total is derived from the tax or percentages on the pari-mutuel or betting organization, which tax is ear-marked by the Treasury to devote to horse-breeding.

What I saw of breeding operations in France gave rise to the following reflections:—

There must always be a large proportion of disappointments in stud work; the number of failures or misfits will always exceed the good ones bred; and the misfit got by the thoroughbred from, say, a light half-bred mare is only too often a misfit in the fullest sense—a disappointment to the breeder, too light for farm work, and scarcely fit for any useful purpose. It is a weed in every sense of the term. France at the present time can, after 60 years of careful selection, show us distinct and well-marked breeds of horse (Normans), which can be depended on to breed true to type.

France breeds for business, and not for pleasure. The aim is to produce the highest class of useful horse. With this definite object in view, the authorities have for the past 60 years been purchasing English mares, free from bias in favour of one strain or another. The shape and not the pedigree of the mare guides the purchase so long as the breeding is pure. They also buy sound young mares for work with the view of breeding from them after.

The point worthy of notice is that owing to the methods pursued on the Continent the foreigner's misfits are unlike ours. The foreigner's is useful for general purposes, if it is not of sufficient quality to sell in the most remunerative market as a carriage horse. It was a surprise to me to

learn that hundreds of pairs of carriage and coach horses have been sold every year in London for £200 to £500 a pair, the purchasers being quite unaware of their foreign origin. If any one should take the trouble to trace their origin, it is stated that then they would find that they came either from the horse-breeding districts of Normandy in France, or from the Oldenburg Province of Germany.

AUSTRALIAN MATERIAL FOR IMPROVEMENT.

As bearing on the subject of the suitability of the Australian thoroughbred for producing horses for foreign markets, the result of experiments in India extending over 12 and 22 years are interesting.

In a paper by the late Vet.-Colonel J. H. B. Haller, who was the general superintendent of horse-breeding operations in India, he states:—"Of the stock got by Australian sires, the young stock often prove better boned in limb than the stock from thoroughbreds imported from England." These observations were made after the system had been twelve years in operation. Colonel Queripel, the Inspector-General in India, 22 years after the system had been in operation, complains that the English thoroughbreds of the stamp required to get remounts grow scarcer and harder to obtain each year. Breeders aim at long-legged, striding animals, which are exactly what India does not require.

On the other hand, a better stamp of thoroughbreds has been procured in small numbers from Australia. Several imported during the official year 1897-8 were between 15.2 and 15½ in height, girthed from 68 to 72½ inches, and only one had less than 8 inches of bone below the knee. It is interesting to note the proportion of prizes won by the progeny of each class of stallions when mated with the light native mares. These figures cover a period of six years, and show the stock of half-bred English sires first, Australian stallions taking second place, English thoroughbreds third. Figures relating to subsequent years show the thoroughbreds imported from Australia in the first place.

RECOMMENDATIONS.

As a result of my inquiries, I am more than satisfied that the improvement of the Australian horse can be largely contributed to by displaying that great care and attention in the judicious selection of stallions and mares as is exhibited by other horse-breeding communities, the necessary material being at present obtainable in the Commonwealth, though probably in limited quantities.

I would suggest—

1. That the Government purchase a number of short-legged, thick-set, thoroughbred stallions, from 15 to 15.2 hands high, of the type being shipped to India, their racing performances being taken into consideration only so far as they convey a guarantee of constitutional soundness. They should be distributed throughout the State for service of half-bred mares only, and made available at a small fee to farmers and others. The merits of this plan are at least twofold. It would prevent the loss to the State of a very desirable type of stallion, and would encourage the production of a greater number of horses suitable for export or general utility purposes.

2. That premiums be offered annually for stallions suitable for improving the breed of horses, the condition being that the winners shall stand in districts to be allotted, at a reasonable fee, to be fixed by the Government, and to be available for service of at least thirty half-bred mares

annually at such fee. This would encourage the private ownership of stallions of a standard approximating to that of the Government-owned stallions.

3. That all stallions be licensed subject to approval of a qualified Board, and no unlicensed stallion be allowed to stand for public service for fees.

4. That the Government give earnest consideration to the great need for discouraging the exportation of mares. This might in part be accomplished by reserving the option of purchasing from each shipment collected for export such mares as it is desired to retain at a fair market price, with the object of selling them to breeders on terms of two, three, or four annual payments.

I have the honour to be, sir,

Your obedient servant,

(Signed) S. OCTAVIUS WOOD.

SOUNDNESS IN HORSES.

S. S. Cameron, M.R.C.V.S., Chief Veterinary Officer.

Definition and Explanation—Classification of Unsoundnesses, hereditary unsoundnesses—Examination for soundness, preliminary examination, manual examination, completing examination.

"Freedom from any abnormality which at present interferes, or in the future is likely to interfere, with an animal's usefulness." Such is a workable definition of the term soundness as applied to horses. Technically, of course, to be sound, a horse must be free from any disease, defect or abnormality whatsoever; but it has been held in the English courts that soundness is a question, not so much of disease, as of usefulness. For instance, while a simple sore on the side of the neck would not necessarily constitute unsoundness, a similar sore behind the withers in a saddle horse or on the shoulder in a harness horse or on any place where it would interfere with the natural usefulness of the animal for the purpose for which it was used would certainly amount to an unsoundness. Consequently, in deciding on the soundness or otherwise of a horse, consideration must be given to the nature of the work he will be called upon to perform. Sidebones, for example, constitute unsoundness in a light horse performing his work at a trot, but in certain stages they may be "passed" in a draught farm horse used on soft land at a walking pace. Again, there are many diseases or ailments which at one stage may render the animal decidedly unsound, but at another are not likely to do so. Splints when forming frequently cause lameness, but when "set" they seldom do so, and their presence in an aged horse should not go against him. Age also, and many other features have to be taken into consideration, so that it will be seen the subject is largely one in which individual opinion and judgment have to be depended on.

It will be convenient, nevertheless, to submit a tabulated list setting out:—

(a) those diseases or defects the existence of which renders a horse absolutely unsound, and

(b) those which may, or may not, constitute unsoundness according to circumstances.

In these lists the italicized words indicate those conditions which are generally and authoritatively classed as hereditary unsoundness. (See page 269, May, 1906, *Journal.*)

CONDITIONS CONSTITUTING DEFINITE UNSOUNDNESS.

Atrophy (local).
Blindness (complete or partial).
Bowed tendons.
Broken-wind (asthma).
Break-down.
Canker (foot).
Cataract.
Corns.
Cough (chronic).
Crib-biting.
Curb.
False Quarter.
Fistulous withers.
Founder or *Laminitis.*
Grease.
Heart Disease.
Hernia (rupture).
Lameness (of any degree).
Lymphangitis (weed or shot of grease).
Mallenders.
Mange.
Melanosis.
Nasal Disease (osteo-porosis).
Navicular disease.
Neurotomy or unnerving (evidence of).
Paralysis (local).
Poll evil.
Quittor.
Rheumatism.
Rickets.
Ringbone.
Roaring (grunting, whistling, and thick wind).
Sallenders.
Sandcrack.
Scirrhus cord.
Seedy toe.
Sesamoiditis.
"Shivering."
Spavin (bone, bog, and blood).
Sprains (back tendon, suspensory ligament, &c.).
Stringhalt.
Speedy Cut.
Wasted shoulder.
Wind-sucking.

CONDITIONS USUALLY, BUT NOT NECESSARILY, CONSTITUTING UNSOUNDNESS.

Broken Knees.
Brushing or Cutting.
Capped elbow
Capped hock.
Contracted feet.
Cracked Heels.
Crib-biting and wind-sucking.
Dropped Hip.
Filled Legs.
Fired Limbs.
Galls (tumified).
Jaundice.
Parrot mouth.
Sidebones.
Sitfasts.
Skin Diseases.
Sores (saddle or harness).
Sore Shins.
Splints.
Thoroughpin.
Thrush.
Tumors.
Warts.
Windgalls.

Examination of Horses for Soundness.

PRELIMINARY EXAMINATION.

It is always advantageous to first see the horse in the stall or box where he has been at rest for a considerable time, so that signs of weaving, crib-biting, wind-sucking or other such stable habit may be detected, and the "pointing" or "favouring" of any limb observed. If the horse is made to "stand over" suddenly in the stall, that suspicious bending of the hocks or "clicking up" of the hind limbs, which is frequently associated

with bone spavin and stringhalt, may be observed, as also the quivering of the tail of a "shiverer." The double flank heave of a broken-winded horse may be looked for at this stage.

After such a casual examination the horse should be brought out with the bare halter on and straightway trotted at a gentle jog trot for the detection of lameness, which is in most cases more pronounced immediately after rest. The method of examination for detection of lameness is to be fully dealt with further on, and it will suffice here to say on this subject that the horse should be trotted as many times as desired to and from the examiner, who should stand fairly in front or behind according as the horse is approaching or going away from him. Particular notice should be taken when the horse is turning, as then any "halting" which has previously escaped notice may be observed.

MANUAL EXAMINATION.

The jogging having been completed, the examiner may proceed to a detailed and manual examination of the horse, and it may be well here to observe that, in the carrying out of this, there is a right way and a wrong way—the one methodical and stylish, and the other slipshod and slovenly. Except the examination is gone about with some method the examiner is apt to become confused and overlook various points. Apart from being more stylish and horsemanlike, the observance of method saves time by avoiding numerous useless turns of the body and repeated handlings. When a particular method of examination is adopted, it should always be adhered to, and the examiner should always have in his mind the unsoundness which may exist in the part being handled, and should not allow his attention to be distracted by the casual observation of anything unusual at any other part, or by the conduct or remarks of bystanders which often have a sinister object. In this way the likelihood of failing to note an unsoundness is reduced to a minimum.

One of the best methods of manual examination, whereby the work can be expeditiously done without making any unnecessary turns or movements of the body, and in which the attitude of the examiner and his use of hands and arms is easy and natural, is that taught by the late Principal Williams, of the New Veterinary College, Edinburgh, whose smartness and neatness in "going round a horse" was the admiration of successive classes of students, and a fitting achievement to emulate. I purpose to represent this method by indicating the action of the examiner and the object of such action in juxtaposed columns. In this way the co-relation of the action and object will be more clearly grasped, and with *viva voce* repetition of these during repeated practice on a few quiet horses the desired "finish" and style will soon be acquired. Smoothness and quietness of motion are essential throughout the examination; jerky or sudden movements, or any action likely to upset, excite or bustle the horse should be avoided.

Action.	*Object.*
Walk slowly round the horse from near to off side at a distance of 3 or 4 yards, with eyes directed successively to each part of the animal.	To get an impression or mind picture of the horse's make and shape, and consequently to opine likely unsoundness: and to observe any weakness of conformation, exaggerated deformity, or obvious unsoundness, such as wasted shoulders, broken knees, bowed tendons, dropped hip, curb and the like.

Action.	*Object.*
Stand directly in front, facing the horse's head, placing the groom on the near side, and standing the horse fair and square, with equal distribution of weight on all four limbs. The horse should be kept in this attitude till the manual examination is completed.	To observe the bi-lateral symmetry of all parts in view—ears, eyes, face, nostrils, jaws, chest, shoulders, forearms, knees, cannons, fetlocks, pasterns, and feet; and to detect paralysis of ears—eyelids, nostrils, lips, or facial muscles, nasal disease, wasting of shoulder muscles, broken knees, splints, enlarged fetlocks, ringbone, sidebone and sand-crack.
Place the groom in front, with a rein in each hand. Step to near side of head, and stand sideways, facing the head. Stroke the nostril and eyelids to establish the horse's confidence; open the lips with both hands, and examine the teeth, lips and gums. Use the left hand for examining forelock, forehead, face, nose and nostril, lifting the flap of the left nostril with the thumb. Use the right hand for examining poll, ear, choke, jaw, jowl and curb, and for lifting the near eyelid.	To ascertain age and sex (canine teeth), to examine tongue and to detect presence of wolf teeth, lampas, ulceration of mouth, nasal disease, nasal catarrh and ulceration, poll evil, ear fistula, enlarged parotid duct, presence of bot-fly eggs on jowl, bit and curb abrasions, and condition of conjunctiva of the eye. (N.B.—If there is champing of the teeth or dribbling of saliva or an undue amount of saliva in the mouth, a special examination of the molar teeth should be made to detect jaggedness, decay, or fracture of the teeth.)
Step laterally to near side of neck and examine it, using the right hand. With the left hand examine the windpipe, and with the fingers press into the jugular gutter and raise the jugular vein.	To detect injuries and to see that the jugular vein is not occluded as a result of "bleeding," which is usually practised on on the off side or the side on which the mane lies.
Step opposite to the near fore limb, still facing sideways, and examine the withers and shoulder, using the right hand.	To detect fistulous withers, collar galls, sore shoulders, wasted shoulder, shoulder tumors and enlargement of shoulder joint.
Turn half round, facing towards the horse's head, and with the palm, thumb, and fingers of the right hand examine the breast and front of the near limb, passing the hand steadily and deftly down the front of the shoulder joint, the forearm, knee, cannon, fetlock, pastern, coronet, and hoof. The examiner should not more than slightly bend his knees while stooping for this operation. Squatting down with the knees and hips bent is unsightly and dangerous.	To detect rail raps, bursal enlargements, broken knees, splints, sore shins, enlarged fetlocks, ringbone, quittor sandcrack, false quarter and laminitis.
Turn full round, facing the horse's hind quarters, and with the left hand examine the posterior aspect of the limb from the elbow to the foot.	To detect capped elbow, sprained muscles, thoroughpin of the knee, mallenders, speedy cut, sprain of the check ligament, flexor tendons or superior suspensory ligament, bowed tendons, splints, scars from unnerving, windgalls, sesamoiditis, brushing, sprain of the inferior suspensory ligament, cracked heels, sidebone, bruised coronet and quittor.

Action.	*Object.*
Place the left foot between the horse's hoofs from the front, with the left knee pressed firmly against the front of the horse's near knee. Bend over towards the back of the limb, and with the thumbs of both hands press upon the seat of sidebone. The pressure against the horse's knee insures that his full weight is thrown upon the foot during the manipulation of the seat of sidebone.	To detect sidebone by the absence of springiness of the lateral cartilages on each side of the coronet when the horse's foot is firm on the ground and bearing weight.
Lift the horse's foot by tugging at the fetlock with the left hand, or preferably by grasping the pastern with the right hand and at the same time pressing the muscles above the arm half-way between the shoulder and elbow with the left thumb. When this pressure is applied most horses will relax the joints and give up the foot straight away.	To examine the under surface of the shoe for "clicking," and of the hoof for contracted heels, wasted frog, thrush, canker, seedy toe, corns and bruises, dropped sole and laminitis. Except the shoe is removed examination for corns and bruises is unreliable.
With the left hand grasp the toe of the hoof underneath and bring the foot forward until all the joints of the limb are fully extended. While the limb is thus straightened out, press upon the front of the knee and fetlock with the right hand.	To detect impediments to the full extension of the limb, and to put the flexor tendons on the stretch, and so detect any flinching from sprain.
Return the foot to the former position, and, while still held up, hand it to an assistant to hold, with the knee and fetlock flexed until the examination of the near side is almost completed.	To prevent the horse kicking while the hind parts are being examined.
Taking a step rearward and facing sideways on to the horse, with the left hand examine the back from the withers to the loins, and with the right hand examine the brisket, flank, abdominal wall and sheath.	To detect sore back, saddle galls, sitfasts, warbles, girth galls, rupture, warts and abnormality of external genitals.
Turn half round, facing forwards, and with the right hand examine the front of the near hind limb from hip to hoof.	To detect dropped hip, dislocation of the stifle-cap (patella), bog spavin, bone spavin, sallenders, splints, &c., as in the fore limb.
Turn full round, facing backwards, and with the left hand examine the croup, quarters and posterior aspect of *the limb down to the heels.*	To detect muscle sprains and wasting or shrinking of the croup or quarters, thoroughpin, capped hock, curb, sprained tendons, &c., as in the fore limb.
Allow the fore limb to be dropped. Lift the near hind foot by bending down and tugging at the fetlock with the right hand, and at the same time exerting a slight tilting pressure with the left hand on the point of the hip. When the limb is lifted, press it backwards, and support it by allowing the fetlock to rest on the left thigh.	To examine the under-surface of the foot and detect defects and unsoundness as in the fore foot.

Action.	*Object.*
Straighten the fetlock by bringing the foot forward with the left hand, as described for the fore limb.	To detect impediments to the full extension of the hind fetlock, and by tensing the back tendons to detect flinching due to sprain.
Bend the pastern backwards, and by *lifting the limb upwards, put the fet-*lock and hock joints in a position of extreme flexion.	To detect pain or stiffness in the hock *from bone spavin, and in the fetlock* from anthritis.
Push the limb back by pressure of the thigh to a position insuring extension of the hock.	To detect pain from spavin and impediments to extension of the hock.
Release the foot, and step to the rear of the horse. Lift and examine the tail, anus, and vulva.	To detect melanotic tumors, docking wound, injury or imperfection of the anus or vulva, or the presence of worm-indicating scurf round the anus.
Stand square behind, facing forwards.	*To observe bi-lateral symmetry of the* croup, hips, quarters, stifles, thighs, hocks, hind cannons and fetlocks.

Proceed then to examine the off-side in the same fashion, making the manual examination with the opposite hand; for example, in handling the front of the off fore limb, the left hand is used instead of the right.

COMPLETING EXAMINATION.

The manual examination having been completed, the examiner should smartly turn the horse round both ways and back him sharply, when, oftentimes "halting" of the hind limbs, or "shivering," will be noticed. The horse should then be placed alongside a wall or fence and tested for grunting or roaring. This is done by taking a firm short hold of the halter or bridle with the left hand, facing towards the body of the horse, and making a sudden feint to strike him. When cringing from the threatened blow a roarer will emit a distinct grunt or groan.

Special examination of the eyes and feet follows, to be carried out as will be described when the diseases of the eyes and feet are being respectively dealt with.

Next, the horse's wind should be tested. For this purpose light horses are given a smart gallop, preferably on heavy going up-hill, and the examiner who rides the horse himself in this test gallop is at a distinct advantage in detecting such laryngeal defects as roaring and whistling and such lung affections as "broken wind." Draught horses are usually yoked to a load and subjected to a sharp up-hill pull, which quickly manifests any abnormal respiratory distress.

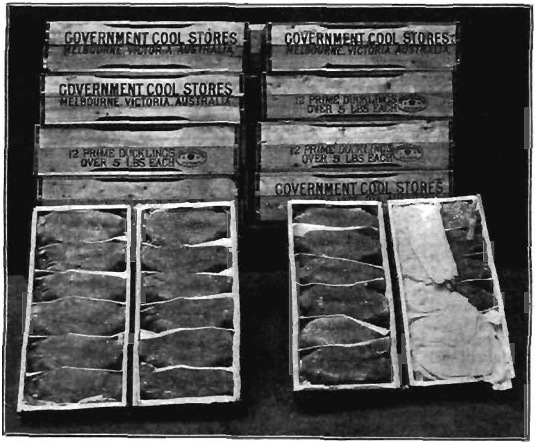
Finally, it is a safe plan to have the horse jog-trotted a second time when he has rested for an hour or so after the gallop or wind test, for then any undiscovered lameness or stiffness will be likely to be made more evident.

DUCKS FOR EXPORT.

A. Hart, Poultry Expert.

A PROFITABLE INDUSTRY.

The duck-breeding and rearing industry in our State at present offers very favorable prospects. We have one of the most suitable climates in the world for this purpose. Our other advantages are equally favorable, and the present prices of grain, root crops, milk, and all other foods must be taken into consideration, and weigh largely in favour of this industry.



DUCKLINGS PACKED FOR EXPORT.

The local trade in ducklings could, no doubt, be much increased by a necessary improvement in the breeds, quality, &c., of the birds reared. We have also an unlimited market in Great Britain and South Africa for properly-fattened poultry of all kinds. Ducklings are specially suitable for the purpose of export, and there is every reason to believe that this industry, if properly fostered and developed, will result in the establishing of a very large and important trade in the near future. There is, however, one point which must be regarded as of the most importance in this industry, and that is the proper feeding of the ducklings intended for market or export. *It does not matter how suitable the breed or cross may* be, or how large the frame, if proper food is not given liberally such stock are worthless for the table, and failure is certain.

The accompanying illustration shows ducklings packed for export. There are twelve birds packed in each crate. Six are packed in each half of the crate, which is then folded together and fastened in the middle. This allows all of the birds to be seen if occasion requires, and is specially suitable to the London markets. The best months for export are from December to March. All ducklings sent in for export should not be less than 4½ lbs. each live weight. They should be as uniform in size and quality as possible. An Aylesbury and Pekin cross is preferable, the Aylesbury drake and Pekin ducks being the most favorable way of mating.

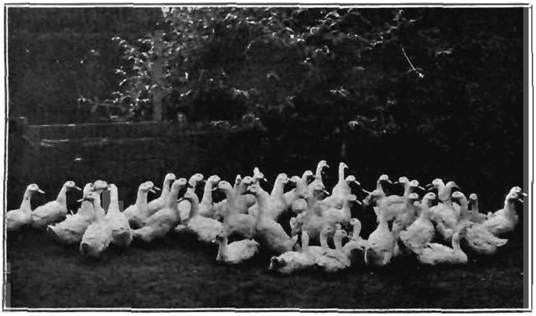
A SUCCESSFUL DUCK FARM.

An instance of the success of rearing ducklings for table purposes is to be found on the farm of Messrs. Goldsmith and Coleman, of Kyneton

FATTENING SHED OF MESSRS. GOLDSMITH AND COLEMAN, KYNETON.

These breeders have been engaged in the industry for several years. The success they have achieved is all the more creditable by the fact that they are a long distance from market, and their district is not nearly so suitable for this purpose as in many other parts of the State. Their annual output runs into several hundreds of ducklings. The breeding pens are made up of Aylesbury drakes and Pekin ducks; one drake to three ducks. These birds are housed in sheds specially adapted for warmth, rapid growth, and fattening. They are kept in lots of twenty ducklings in each pen. These pens are built in a very large shed with a passage running right down the centre of the building. The yards are made of closely-battened hurdles 2 feet high. The feeding troughs, which are V-shaped, are placed outside of the pens, and run down the whole length of the building on either side of the passage. The feeding is performed from three to four times a day; for the first month they are fed four times daily, and

after that three times. The food is all good and sound. During the first week, the food is given fairly dry and crumbly, and after that moist. Bran, pollard, vegetables, and root crops are the staple foods. Skim milk is used, and all food is scalded with boiling water and allowed to cool before feeding. Grit and green food are given liberally, and are always at hand. The grain used is wheat and barley, which are mixed with the soft food. The troughs are always well cleaned out after each meal, and care is taken to have all other surroundings perfectly clean. The ducklings are placed in pens according to age and size, and this point is strictly adhered to right through. The feeding is on a very liberal scale, and the fattening process is completed in from ten to twelve weeks. The cost of the food for ten weeks runs into 1s. 7d. per pair. The weight of the ducklings at this age will average from 9 to 10 lbs. per pair. At the average price of 6d. per lb. live weight this would return 4s. 6d. and 5s. per pair. Adding the value of the eggs (which would be about 1½d. each) to the cost of food, would make the outlay 1s. 10d.,



PEKIN AND AYLESBURY DUCKLINGS.

10 weeks old. Average weight, 6 lbs. Fattened by Mr. P. Briggs.

leaving a margin of from 2s. 8d. to 3s. 2d. per pair. The cost of housing, attention, &c., would not be large, especially when a large quantity is kept. At the early part of the season, ducklings would bring up to 7½d. per pound for local consumption; but this would only be for a limited number.

It must be remembered, however, that on no account should a breeder try to rear more stock than he can house, keep, and look after properly. This fault of over-crowding, accompanied often by under-feeding, is responsible for many failures in both ducks and poultry.

A SUCCESSFUL BREEDER.

Mr. P. Briggs, of South Brighton, whose name is a household word in connexion with the breeding of pure-bred Aylesbury and Pekin ducks,

has been in this line for many years, and his success is too well-known to need any comment. His system of feeding is a little more expensive than that of the first-named breeders, but, on the other hand, the results are better. Although the figures given are for the rearing of pure stock for exhibition and breeding purposes, they can be applied equally in the case of rearing crossbred birds for table. The cost of feeding the ducklings reared by Mr. Briggs up to ten weeks old is estimated to be 2s. 6d. per pair. The weight would average about 6 lbs. each, valued at 3s., at 6d. per lb. This amount, less the cost of eggs, feeding, attention, &c., would leave a very satisfactory margin over the outlay. Mr. Briggs keeps and feeds his stock on the most approved and up-to-date lines. The food given is somewhat similar to that given by Messrs. Goldsmith and Coleman, with the exception of blood meal, also lucerne and young green maize chaff. The blood meal is used when they are three weeks old, and produces excellent results. A pound of blood meal mixed in the soft food is given to each pen of twenty ducks about three or four times a week. The lucerne and young green maize chaff are added regularly to the daily food. All food is scalded and mixed with separated milk. Shade and regularity in feeding are, in the opinion of Mr. Briggs, the most important points in the rearing of ducklings, and he attributes his success, to a great extent, to careful attention to these points.

A Warning to Breeders.

In conclusion I would call attention to the deterioration of ducks for table purposes through being crossed with the Indian Runners. The latter are certainly good layers, especially in the winter months, but they are altogether a failure from a table point of view, and are sold at auction for very low prices. They are also useless as a cross with the larger varieties, and breeders should be careful not to introduce any of their blood into stock intended for breeding ducklings for table purposes or export.

EXPORT OF EGGS.

The following report relative to the consignment of 305 cases of eggs from Victoria, which arrived at London, per R.M.S. *Britannia*, in December last, has been received from Mr. P. T. Peppard, Inspector of Products, through the Agent-General. A quantity of eggs from South Australia was also carried by the same vessel:—

"The eggs were in cases containing 20 dozen each, and were packed in cardboard fillers and paper shavings. The South Australians substituted kiln-dried husks for the paper shavings. The eggs were graded into four classes, namely:—1. large brown; 2. brown; 3. large white; 4. white. In the South Australian consignment the infertile eggs were packed separately.

The eggs were carried between 33 and 38 degrees Fah., and there is every reason for shippers to be pleased with their condition on arrival.

I saw the eggs being discharged from the ship, and found the cases clean, and the handling carefully done. On examination in the Cool Stores, the eggs had the appearance of new laid, and 'candled' satisfactorily. There was little or no shrinkage, and on breaking open some eggs the yolks were quite firm. I was also able to see the South Australian eggs in the Cool Store, and I must say that I prefer the husks to paper shavings for packing. The husks work down into the compartments of the fillers and prevent the eggs from oscillating. The custom of the trade here in shipping eggs to South Africa is to pack in husks.

Owing to few of the egg merchants having had an opportunity of seeing this consignment of eggs up to the time of writing this report, I have not been able to form any definite idea as to whether the size of our package is suitable for this market. So far, the idea seems to prevail that it is too small. The eggs sent from Denmark, Sweden, Russia, Germany, Austria, and other Continental parts, with the exception of France, are usually in cases containing 1,440 eggs, and packed with wood wool, and straw; a trade allowance is made of 60 eggs for breakages. Sometimes the cases only contain 960 eggs. The French case generally contains 720 eggs, but may only, especially in the case of fresh heavy eggs, contain 360 eggs. The only package differing materially from those sent from the Continent is the Canadian case, containing 360 eggs, packed in fillers, and this package has been suggested to me by one or two egg merchants as a suitable one to copy. A specimen case has been sent to Mr. Crowe, Superintendent of Exports, Melbourne.

Judging from inquiries instituted, there seems to have been no previous effort made to pack infertile eggs separately, but, nevertheless, the idea is one worth a little further experiment. The theory, of course, is that the eggs will keep longer in good condition, and, should this prove to be the case in practice, the system would be a commendable one.

Eggs are sold here by the 'long' hundred (120 eggs). During the months of October, November, and December, there is usually a scarcity of supply.

The market prices to-day (14th December) are about as follow:—

Danish and French	18 lbs.	per 120 eggs ...	19s. 6d.
.. ..	17 lbs.	.. ...	18s. 9d.
.. ..	16 lbs.	.. ...	17s. 9d.
.. ..	15 lbs.	.. ..	17s. 0d.
Italian	17 lbs.	.. ...	14s. 6d.
.. ..	16 lbs.	.. ...	13s. 6d.
.. .. ..	15 lbs.	.. ...	13s. 0d.
Russian ...	15 lbs.	.. ...	9s. 6d.
Canadian ..	...	... ...	10s. 0d. to 11s. 0d.
Russian cold-stored eggs		... ...	6s. 9d. to 7s. 9d.

It is expected that prices next week will be 2s. to 3s. lower, as buyers have already laid in a stock, and will be busy then with poultry and the Christmas trade generally.

I learn that some of the above eggs have realized up to 12s. per 120, but shippers will, no doubt, be advised by cable of the complete sales."

[Note.—According to the account sales received by the consignors the prices realized for the Victorian shipment were as follow:—Large brown, 12s. per long hundred; large white, 11s.; brown, 9s. 6d.; white, 9s.—Editor.]

REPORT ON THE HARVEST RETURNS OF WHEAT VARIETIES.

NORTHERN GRAIN EXPERIMENTAL FIELDS, SEASON 1906-7.

F. E. Lee, Agricultural Superintendent.

In order to recall the attention of the reader to the importance of the harvest returns of the wheat varieties under review, some little explanation is necessary regarding the constitution of the experimental wheat fields and the objectives of the work in hand.

The season to which these returns refer is the second on the northern wheat experimental fields, the full term of which is seven years. In the first year the whole area (10 acres) was sown down in wheat, oats, and fodder crops, the complete report of which appears in the *Journal* for March, 1906. That portion previously under fodder crops was sown with wheat varieties last season, the remainder of the field being fallowed.

The Objectives of the Experiment.

The main object, broadly speaking, of the whole experimental work is the search after ways and means by which the average yield of wheat for the State may be improved. There are three distinct and separate channels through which this is being attempted, viz., improved methods of cultivation, the intelligent use of artificial fertilizers, and the introduction of new and improved varieties. The results of the two or even three seasons are hardly sufficient to establish more than general principles, and I must therefore ask the wheat farmer to display patience in following the development of the trials projected. The work of the first season largely confirmed previous experiments with artificial fertilizers, inasmuch as it showed the superiority of the superphosphate over other forms of phosphatic manures, and further emphasized the inutility (up to the present time) of the addition of nitrogenous and potassic manures to the wheat soils in the north. The trials of improved methods of cultivation were naturally indicative of nothing in particular in their first year, but with the approaching season, three separate methods of fallowing (ordinary bare fallow, rape fallow, and sub-soil fallow) will be tested side by side. That the result will be watched with the keenest interest by northern wheat farmers may be anticipated, and perhaps more particularly so because it is proposed also to test the capabilities of the "Soil Packer," a new implement, which is said to have given a great impetus to wheat farming in the dry areas in America. My experience leads me to believe that the most satisfactory, permanent, and economical solution of the problem of improving the State yield of wheat lies in the direction of better cultivation, thereby promoting better storage and conservation of soil moisture. This will not necessarily mean a new equipment of implements, but the altered conditions, in my opinion, will gradually tend to more concentration of effort; in other words, the present large areas put under crop will gradually be reduced, and the same

HARVEST RETURNS OF WHEAT VARIETIES, NO

VARIE

Name and Address of Experimenter.	Ranji. 1	Waddy. 2	Cumberland. 3	Outpost. 4	Wilkinson's Early Purple Straw. 5	Steinwedel. 6	Improved Steinwedel. 7	Nut Cut. 8	Schneider. 9	Smart's Pioneer. 10	Terkin. 11	King's Early. 12	Warrick. 13	Steer's Early Purple. 14	Fan. 15	Silver King. 16	Farmer's Friend. 17
MALLEE AND MALLEE FRINGE.																	
Mudge, J. Sea Lake	12.6	14.6	16.3	16.8	15.6	15.3	17.0	16.3	15.5	13.5	12.5	12.5	17.5	16.0	15.3	14.3	14.5
Williamson, W., Boort	7.1	12.7	17.1	15.7	18.5	14.9	17.9	17.2	19.2	17.0	17.0	16.6	13.0	15.6	15.6	22.3	18.8
Innis, D. B., Rainbow	1.6	5.0	4.3	7.3	8.5	5.9	7.6	7.1	7.1	7.7	9.6	10.9	10.8	9.1	13.1	13.0	11.0
Barber, A., Birchip	1.3	3.5	4.6	6.0	7.6	7.0	8.7	8.0	7.5	7.7	7.5	8.0	13.0	13.1	12.8	12.5	11.0
Allen, James, Willenabrina ..	1.1	6.2	8.4	9.0	10.0	5.8	8.2	6.0	8.2	8.5	7.3	8.3	10.5	16.1	15.6	17.0	18.0
Lavery, J., Watchem	6.6	6.3	10.5	8.3	9.8	10.0	12.0	10.1	9.0	10.8	11.8	12.3	12.3	14.1	16.6	17.6	21.0
Bennett, J., Warracknabeal	9.8	9.1	10.8	8.6	9.5	9.0	10.6	10.6	7.3	9.1	8.0	7.6	17.8	21.8	17.0	17.0	16.8
Witney, J., Jeparit ..	Cut for hay													6.0	5.7	9.4	8.0
Milbourne, J., Warracknabeal ..	Cut for hay													7.5	7.5	8.5	11.6
Average yield per acre ..	5.7	8.2	10.2	10.2	11.3	9.8	11.7	10.7	10.5	10.6	10.5	10.8	13.5	13.2	13.0	14.6	14.5
WIMMERA DISTRICT.																	
Tepper, Mrs. J. P., Coromby ..	9.4	10.0	9.9	9.9	11.3	7.7	9.0	7.5	8.3	13.0	11.0	12.6	18.3	20.0	18.6	21.1	18.3
Feery, J., Dimboola	4.2	8.9	6.4	9.4	9.5	11.0	13.3	10.2	10.4	13.4	10.4	13.5	9.4	18.7	21.0	22.5	25.9
Nowatna, C., Jung	15.0	16.6	24.2	20.9	20.0	17.8	23.8	20.0	25.6	26.8	15.3	12.5	13.2	21.4	29.8	36.0	27.3
Gibbins, E., Wall ..	Cut for hay													28.0	26.5	29.0	28.2
Boyd, A., Minyip ..	Cut for hay													20.0	25.8	25.0	25.0
Hutchings, A., Lubeck	Destroyed by storm																11.7
Average yield per acre ..	9.5	11.8	13.5	13.4	13.6	12.1	15.3	12.5	14.7	17.7	12.2	12.8	13.6	21.6	24.3	26.7	22.7
NORTHERN AND NORTH-EASTERN.																	
Pollard, H., Glenloth	5.0	3.5	6.6	5.6	7.6	8.6	8.0	7.5	7.6	5.3	4.0	4.5	11.0	13.3	12.1	18.3	19.1
Carter, J., Marong	6.0	5.7	7.6	14.2	14.5	14.0	18.9	20.8	30.6	25.9	16.6	13.9	15.0	11.3	16.5	24.3	18.6
Sproat, W., Donald ..	3.2	7.0	11.3	16.3	13.1	17.6	25.8	20.3	23.6	20.8	22.1	25.0	23.6	25.0	18.3	33.0	28.3
Hunter Bros., Elmore	..	10.0	13.0	11.5	16.0	13.5	17.0	10.5	11.5	15.5	9.5	18.5	13.0	17.0	16.5	20.5	14.0
Trewick, J., Elmore	12.3	13.1	19.6	19.3	16.3	17.6	21.0	18.6	23.6	18.8	19.1	17.1	16.3	18.8	23.6	23.8	18.6
Nixon Bros., Eddington	14.1	14.6	34.6	24.3	24.5	22.8	28.0	24.0	24.8	25.3	27.6	24.6	23.6	25.8	26.3	29.8	23.5
Bray, W., Merrigum	Destroyed by sparrows and cut for hay														10.9	13.8	13.7
Sharp, T. R., Goorambat	Cut for hay													6.5	8.1	8.9	9.7
Average yield per acre ..	8.1	8.9	15.4	15.2	15.3	15.6	19.7	16.8	20.2	18.6	16.4	17.2	17.0	16.8	16.5	21.5	18.1
Average for whole State ..	7.2	9.1	12.8	12.6	13.2	12.4	15.8	13.3	14.8	14.8	12.9	13.5	14.8	16.4	16.9	19.8	17.9

RTHERN EXPERIMENTAL FIELDS, SEASON 1906–7.

TIES.

Bole.	John Brown.	Gluyas.	Hudson's Early Purple Straw.	College Purple.	Majestic.	Australian Talavera.	Newman's.	Frampton.	Petatz Surprise.	Jade.	Federation.	Tarragon.	Sussex.	Boomerang.	Marshall's No. 3.	Dart's Imperial.	White Tuscan.	Kubanka.	Tardent's Blue.	Manitoba.	Farmer's own Wheat.
18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
11.5	8.8	10.0	12.8	11.8	13.3	16.8	15.3	17.1	14.3	17.0	16.5	15.0	13.3	14.8	16.1	15.5	14.8	11.3	15.5	8.6	..
13.8	23.5	16.6	17.6	19.1	14.1	22.4	11.6	11.8	11.0	13.3	22.5	16.0	15.6	12.0	10.6	14.1	16.0	14.5	19.6	11.6	11.8
5.8	9.3	6.6	12.3	11.5	11.7	10.8	9.1	10.3	11.5	13.6	17.8	15.1	15.5	8.3	11.3	12.0	12.7	10.5	13.4	15.2	16.6
8.0	7.6	7.6	9.6	9.6	12.6	11.3	9.6	10.5	6.3	13.1	15.5	10.5	11.3	9.5	13.8	15.6	15.5	12.8	11.1	12.1	..
10.9	11.0	10.6	11.7	12.0	13.3	16.7	11.6	13.5	12.5	13.0	20.3	12.8	14.5	5.0	11.4	13.8	9.6	11.8	6.5	5.8	5.4
15.6	15.3	10.1	15.3	11.8	14.3	20.3	11.2	12.3	11.5	16.3	20.5	17.5	16.3	12.3	13.5	13.3	17.3	21.6	18.3	10.8	13.6
10.8	14.6	13.0	15.1	12.5	11.1	18.1	14.6	12.5	10.1	19.6	25.6	19.5	18.8	15.3	20.6	20.0	21.5	12.0	17.0	13.3	11.3
3.5	4.4	3.0	4.1	5.1	8.3	11.0	8.3	12.9	8.6	12.0	12.1	12.3	14.0	9.5	10.4	14.0	10.6	9.6	13.0	11.0	7.6
5.0	5.0	5.0	5.0	5.3	14.1	13.0	16.6	17.1	10.8	15.5	20.5	10.8	16.0	9.6	13.0	18.0	17.5	10.3	10.8	13.3	18.3
9.4	11.0	9.1	11.5	10.9	12.5	15.6	11.9	13.1	10.7	14.8	19.0	14.3	15.0	10.7	13.4	15.1	15.0	12.7	13.9	11.3	12.0
13.0	14.1	15.0	18.3	21.1	23.6	25.0	18.6	22.5	18.3	23.8	28.8	25.0	25.8	16.0	23.3	23.3	20.8	24.6	20.8	18.8	..
14.2	6.7	7.5	10.0	11.9	9.0	9.1	10.5	12.2	10.9	13.7	13.0	9.7	13.1	6.8	10.6	11.5	7.6	6.1	7.1	3.5	7.8
26.5	28.0	18.8	32.4	32.2	29.7	36.1	19.7	31.2	23.8	36.7	42.9	39.1	33.8	15.5	34.3	35.7	33.2	22.8	17.5	32.1	32.1
19.7	25.9	23.2	20.1	27.0								Cut for hay									
22.5	21.6	16.6	23.3	22.5	22.5	21.3	27.1	25.0	23.6	30.0	37.5	23.0	28.3	21.6	25.8	30.8	20.0	18.6	20.0	16.6	20.0
9.9	16.4	16.7	10.0	15.0	23.0	27.8	21.6	31.3	18.8	29.9	28.1	27.5	30.0	16.6	33.3	33.3	35.0	25.0	24.6	16.6	25.0
17.6	18.7	16.3	20.5	11.6	21.7	23.8	19.5	24.4	19.0	26.8	30.0	24.8	26.2	15.3	25.4	26.9	23.3	19.4	20.0	17.5	21.2
17.0	21.0	16.3	19.5	13.6	17.0	14.6	13.6	14.8	10.1	16.3	20.6	14.2	15.8	11.1	15.0	13.6	15.0	11.3	14.5	3.6	..
23.5	21.5	13.1	22.3	24.8	19.6	26.1	15.0	23.5	16.0	25.6	31.1	26.0	23.0	8.1	23.3	25.6	24.1	21.6	18.3	13.5	16.6
25.0	15.8	16.6	29.3	29.3	30.0	35.3	22.5	32.3	22.6	30.0	40.3	30.0	31.6	12.3	30.3	33.8	32.0	20.0	28.3	21.6	29.3
16.0	27.5	15.5	17.5	21.0	15.5	24.0	16.5	24.5	15.0	19.5	24.5	32.0	30.0	14.0	18.0	27.0	26.5	20.5	25.5	17.0	..
20.6	15.3	19.1	27.3	16.5	24.1	27.5	17.1	22.6	17.3	26.1	33.5	29.1	28.5	11.5	18.1	25.8	17.5	41.1	20.3	20.8	23.0
29.5	29.6	19.6	30.8	31.1	29.8	30.9	13.5	33.8	20.6	35.6	41.3	40.0	38.0	10.3	37.6	38.1	34.5	34.3	31.3	23.6	32.1
13.7	13.1	9.5	10.6	9.9	9.6	11.9	6.9	6.5	11.4	13.7	18.5	14.9	13.0	5.2	8.6	7.5	6.9	12.7	10.0	5.1	11.8
8.6	7.3	3.5	7.0	10.0	9.7	10.5	6.1	9.7	6.9	9.2	13.1	9.7	7.6	1.9	5.2	7.1	4.8	4.2	2.2	2.0	3.2
19.2	18.8	14.1	20.5	19.5	23.6	23.6	13.9	20.9	14.9	22.0	27.8	24.4	23.4	9.3	19.5	22.3	20.1	18.2	18.8	13.4	19.3
15.0	15.7	12.3	16.9	16.7	17.0	20.3	14.1	18.4	14.6	20.1	23.9	19.7	20.0	11.2	18.3	20.4	18.7	16.2	16.6	13.4	16.8

amount of labour put into a smaller area, will have the result of producing the same amount of wheat at a probably lower cost per bushel than is the case at present. It seems generally accepted that wheat and sheep farming are two industries which are interdependent: such being the case, an alteration of methods entailing the growth of such crops as rape, peas, or other fodder plants is being forced on the wheat-grower in order to insure the success of the lamb-raising industry. This establishes a rotation of crops, and at the same time brings about a most desirable end in the restoration of humus to the soil by medium of the refuse of the crops themselves and the droppings of the sheep. The use of artificial fertilizers and the introduction of new wheat varieties, both highly important in themselves, are immensely assisted when the physical condition of the soil is such as to allow of more perfect aeration, nitrification, absorption and conservation of moisture. Without these latter, a large part of the money expended by the farmer in the purchase of manures and seed is rendered useless by the inability of the soil to respond.

The main features then of the wheat experiments being made clear, we may proceed to inquire what so far has been the progress in the direction of the introduction of new wheat varieties towards the solution of the main problem.

HARVEST RETURNS OF WHEAT VARIETIES.

All seed was graded and pickled with blue stone previous to sowing, at the rate of 50 lbs. per acre. Superphosphate at the rate of 56 lbs. per acre was used uniformly on all varieties. Sowing took place during the months of April and May, and in all cases was carefully and accurately done by the officers of the Field Branch. During the progress of growth, the crops were regularly inspected and field notes made, to establish the habits of growth as well as any particular characteristics of the different varieties.

It will be remarked that the yields of plots 1 to 13 inclusive, are in the majority of cases lower than the remainder of the field. I attribute this, not so much to the varieties themselves, which were all early wheats, but rather to the fact that this portion of the field bore different fodder crops in 1905, and was thus practically cropped two consecutive years.

CRITICISM OF THE RETURNS.

One cannot study the above returns without being impressed with the fact, that under identical soil and climatic conditions, some varieties show a marked superiority over others. That this superiority is fairly uniform in all districts, is to my mind complete evidence of the universal suitability of these varieties, and my opinion is confirmed by the fact that, out of the ten leading varieties last year, nine of them again occupy the leading places. This should be sufficient to establish the claims of these varieties, viz., Federation, Jade, Dart's Imperial, Australian Talavera, Sussex, Silver King, Tarragon, White Tuscan, Frampton and Marshall's No. 3, to more extensive trial by farmers themselves, on a larger scale than the scope of the plots allows.

Some of the maximum yields have been truly magnificent, and out of a total of thirty-eight varieties, no less than thirty-one have yielded from

6 to 10½ bags per acre. The following classification shows the varieties in their order of excellence:—

Name of Wheat.	Maximum Yield.	Minimum Yield.	Average Yield of all Districts.	Name of Wheat.	Maximum Yield.	Minimum Yield.	Average Yield of all Districts.
	Bushels	Bushels	Bushels		Bushels	Bushels	Bushels
Federation ..	42.9	12.1	23.9	Bobs	29.5	3.5	15.0
Dart's Imperial ..	38.1	7.1	20.4	Schneider ..	30.6	7.1	14.8
Australian Talavera	39.0	9.1	20.3	Smart's Pioneer..	26.8	5.3	14.8
Jade	36.7	9.2	20.1	Warrick ..	23.6	9.4	14.8
Sussex	38.0	7.6	20.0	Petatz Surprise..	23.8	6.3	14.6
Silver King ..	36.0	8.5	19.8	Newman's ..	27.1	6.1	14.1
Tarragon.. ..	40.0	9.7	19.7	King's Early ..	25.0	4.5	13.5
White Tuscan ..	35.0	4.8	18.7	Manitoba ..	32.1	2.0	13.4
Frampton ..	33.8	6.5	18.4	Nut Cut ..	24.0	6.0	13.3
Marshall's No. 3 ..	37.6	5.2	18.3	Wilkinson's E. P. Straw	24.5	7.6	13.2
Farmer's Friend ..	28.3	8.0	17.9	Terkin ..	27.6	4.0	12.9
Majestic	30.0	8.3	17.0	Cumberland ..	34.6	4.3	12.8
Hudson's Purple Straw	32.4	4.1	16.9	Outpost ..	24.3	5.6	12.6
Fan	29.8	5.7	16.9	Steinwedel ..	22.8	5.8	12.4
College Purple ..	32.1	5.1	16.7	Gluyas.. ..	23.2	3.0	12.3
Tardent's Blue ..	31.3	2.2	16.6	Boomerang ..	21.6	1.9	11.2
Steer's Purple Straw	28.0	6.0	16.4	Waddy ..	16.6	3.5	9.1
Kubanka ..	31.3	4.2	16.2	Ranji	15.0	1.1	7.2
Improved Steinwedel	28.0	7.6	15.8	Farmer's own Wheat	32.1	3.2	16.8
John Brown ..	29.6	4.4	15.7				

It is particularly interesting to compare the average yield of the farmer's own wheat (plot 39) with the leading varieties. There are no less than fourteen varieties showing a higher average yield than the seed provided by the farmer (mostly Purple Straw and Dart's Imperial), and no less than sixteen varieties showing a higher maximum yield. These facts are given prominence in order to urge the introduction of new varieties of proved suitability. It is gratifying to find such well-known wheats as Dart's Imperial and Marshall's No. 3 occupying leading places, and the high position of White Tuscan and Frampton should bring these formerly well-known varieties again into popularity, more particularly in those districts where the rainfall is sufficient to support the flaggy growth peculiar to them.

THE MILLING PROPERTIES OF WHEAT.

Although the general purpose of the wheat experiments has hitherto only been in the direction of improving the yield, there are other and equally important considerations to be kept in mind when new varieties are advocated. It is, I think, generally understood that some varieties of wheat are better flour producers than others, and millers have done much to urge farmers to take up those varieties which produce a "strong" flour. The farmer, however, from his point of view, often knows little or nothing, about the flour-making properties of the wheat he sells, and probably cares less, nevertheless a mutual advantage is to be gained by both miller and farmer in the growth of those varieties, whose characteristics lie in the direction of flour production of a high quality.

It is stated that in some parts of New South Wales millers offer a premium of from 3d. to 6d. per bushel for wheats of special flour-producing quality. If such is the case, there is no reason why Victorian farmers should not secure similar extra payment for the same varieties.

In the absence of any consecutive official series of analyses of the milling qualities of wheat by this Department, I extract the following notes (of varieties under review) from an article published by Mr. F. B. Guthrie, Agricultural Chemist, New South Wales, whose research work in conjunction with the late Mr. Wm. Farrer, wheat experimentalist, is so favorably known. The milling notes are taken from samples milled at Mr. Guthrie's laboratory, and represent the average of a considerable number of samples. The figures for gluten are the percentages of gluten dried at 100 deg. C. Those for "strength" are the number of quarts of water absorbed by a 200 lb. sack of flour, to produce a dough of suitable consistency for bread-making.

RESULTS OF NEW SOUTH WALES EXPERIMENTS.

(*From Agricultural Gazette of New South Wales, January, 1907.*)

Cross-bred Wheats.

Federation.—A cross between Purple Straw and Mr. Farrer's Fife-Indian wheats. The cross was designed to improve the flour strength of the original Purple Straw. It is early ripening, drought resisting, very prolific, and holds its grain well. It is best suited to warm districts, and prefers fairly rich soil. It is not rust resistant, and is inferior for hay on account of the shortness of the straw, which is otherwise of good quality.

Jade.—A cross between Jaciuth (of Purple Straw descent) and Early Baart. It is extremely liable to rust; is a fairly early wheat, a heavy yielder, and does not shell. It withstands drought well, is a hardy wheat, and gives good results on poor soil in dry districts. It is a good hay wheat.

Cumberland.—A Purple Straw Cross, grows quickly, and is a prolific yielder; it does well in hot, dry climates, and is a good hay wheat.

Schneider.—A cross containing three-quarters Purple Straw blood with a little Fife and Ward's Prolific; it is suited to warm, dry districts, resists drought fairly well, and is a fairly prolific yielder.

Bobs.—The result of a cross between a sport from Blount's Lambrigg and Bald Skinless Barley (Nepaul Barley); is regarded as the best rust resisting wheat we have, is a quick grower, good cropper and drought resister. It thrives best in moderately cool climates, and on soil that is not too rich, is susceptible to frosting if sown too early, has a slight tendency to shell and is a good variety for hay. It is liable to infection by bunt, and therefore pickling should be carefully done.

Fife-Indian Wheats.

John Brown.—A cross containing the blood of two Fife wheats and Australian Talavera amongst others. Resists rust well, is a heavy and reliable cropper, and holds its grain well. Is especially suited to warm and fairly warm districts, and is fairly drought resistant. It ripens in mid season, and is a good hay variety. The grain is rather liable to bunt.

Tarragon.—A cross between Tardent's Blue and Improved Fife, with Australian Talavera. Resists rust well, is a heavy cropper, a good milling wheat, and also good for hay. Is rather a late variety, and is best

MILLING CHARACTERISTICS.

Variety.	Weight per bushel.	Flour.	Pollard.	Bran.	Gluten.	Strength.	Milling Notes.
		%	%	%	%	%	
Federation	62	71	14.5	14.5	12	52	Easy to mill. Bran large and clean. Pollard clean. Semolina, white and soft. Break-flour, 25.8 per cent.
Jade	64	72	13.0	15.0	10	49	Easy to mill. Bran and pollard, clean. Flour parts easily. Semolina, white and slightly gritty. Break-flour 30.5 per cent.
Cumberland ..	62	72	12.0	16.0	11	47	Easy to mill. Bran, clean, large, and flaky. Pollard fairly clean. Semolina, white and soft. Break-flour, 17 per cent.
Bobs	63	70	15.5	14.5	11	54	Fairly easy to mill. Bran and pollard clean. Semolina, yellow and gritty. Break-flour, 17 per cent.
John Brown ..	61	70	15.0	15.0	12	51	Bran and pollard, fairly clean. Semolina, white and slightly gritty. Break-flour, 20 per cent.
Tarragon	62½	78	13.0	9.0	13	53	Bran and pollard, very clean. Semolina, yellow and slightly gritty. Break-flour, 6 per cent.
Steinwedel	63	72	13.0	13.0	10	49	Bran and pollard, fairly clean. Flour clings to bran. Break-flour, 25 per cent.
Farmer's Friend ..	62	72	13.0	15.0	9	48	Flour clings to bran. Bran and and pollard, not very clean. Semolina, white and soft. Break-flour, 30 per cent.
Australian Talavera ..	63	73	10.0	17.0	11	51	Bran and pollard, clean. Semolina, slightly yellow and gritty. Break-flour, 18 per cent.
Dart's Imperial ..	62	72	14.0	14.0	11	48	Bran and pollard, clean. Semolina, white and soft. Break-flour, 30.9 per cent.
Marshall's No. 3 ..	63	73	13.0	14.0	12.5	51	Easy to mill. Bran and pollard, clean. Semolina, white and rather gritty. Break-flour, 22 per cent.
Kubanka	62	72	19.0	9.0	15.0	54	Rather difficult to mill. Bran and pollard, clean. Semolina, yellow and very gritty. Break-flour, 7 per cent.

suited to highland and cool climates. Does not resist drought well, and is rather weak in the straw.

Other Wheats.

Steinwedel.—Originated in South Australia: resists drought well, and is suited to hot dry districts. Is very early, stools well, and yields heavily, but the grain shells badly.

Farmer's Friend.—A Purple Straw variety derived from the old Red Straw; stools strongly, resists drought, very prolific, ripens in mid season, and holds its grain well. Does well even on poor land, but on rich soils and in moist seasons is liable to suffer severely from rust.

Australian Talavera.—Belongs to the Lammas group; is a hardy, prolific, free stooling wheat; is fairly drought resistant, and withstands cold weather. Is fairly rust resistant, a good hay wheat, but rather liable to shell.

Dart's Imperial.—Originated from seed selected by Mr. Dart, of South Australia. Is of the Purple Straw type, but rather later than most. It is liable to rust, but resists drought well and is suited to hot climates; stools freely, and gives good yields of grain and hay.

Marshall's No. 3.—A variety originated by Mr. Marshall, of South Australia, and is derived from Ward's Prolific. It is rust resistant, fairly prolific, moderately good drought resister, and ripens medium to late in the season. Has a tendency to make a large flag, and is a good hay wheat.

Kubanka (Macaroni Wheat).—One of the best of its kind. Is a bearded variety, and unsuitable for hay. Is a good drought resister, stools weakly, is not a prolific yielder. Its chief advantages are that it will yield in seasons when other wheats are killed out by drought.

To reduce the figures on previous page to common terms, it will be seen that the strongest flour wheats of those grown on Victorian experimental fields are Bobs, Kubanka, Tarragon, and Federation, while the weakest in that respect are Cumberland, Dart's Imperial, Farmer's Friend, Steinwedel, and Jade. It is hoped that this information will prove of service to farmers having the desire to improve the quality as well as the quantity of wheat they produce.

* * * * * * *

PROJECTED DEPARTMENTAL INQUIRY.

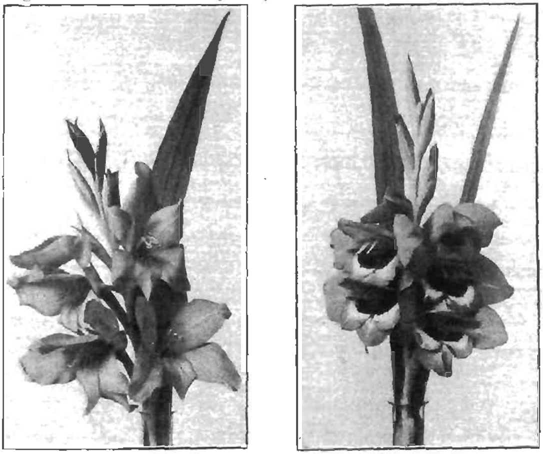
The wheat-growing industry is too valuable a one to the State to allow of any scientific investigation being left undone which might jeopardize the extension of the industry, and also of our growing export trade in flour. The development of markets for flour in the East and South Africa, and the keen competition of other countries demand the improvement of our wheat varieties by every means possible. It is hoped before long to mature a scheme whereby the systematic and continuous analyses of Victorian wheats will be undertaken by the scientific staff of the Department, with the view of affording information of advantage both to the local miller and wheat producer. Meanwhile the experimental fields serve the very useful purpose of sorting out the varieties both suitable and unsuitable to the varying climatic and soil conditions of our northern districts.

GARDEN NOTES.

J. Cronin, Inspector Vegetation Diseases Acts.

The Gladiolus.

Gladiolus is a genus of bulbous rooting, perennial plants, chiefly found native in South Africa. Some few species have been discovered in South and East Europe and West Asia, but the majority, and the most important, are natives of Cape of Good Hope. The original species are rarely found growing in gardens, except in botanical collections, having been superseded by hybrid varieties of superior character as ornamental plants. During the last 50 years hybridizers in various parts of Europe, and latterly in England and America, have paid special attention to the gladiolus, and



GLADIOLUS: KELWAY HYBRID TYPES.

have produced varieties of a greater diversity of colour in the flowers, larger individual and finer marked flowers, and more robust and larger spikes. There are several recognised types, noted for some distinctive marking or characteristic, among the most important being the early flowering section, a hardy type that will endure severe frost; Lemoinei, red and yellow varieties with a large, purplish blotch on the lower segments of the flowers; Childsii, an American raised type, with flowers of great size and bright colour; and Kelwayi, an English strain producing large spikes of finely coloured flowers. Many of the finer new varieties are raised from Gandavensis and Nancieanus, both hybrid types, of which improved varieties

are also being raised. The range of colour embraces almost all shades of white, crimson, yellow, and purple, many kinds being finely blotched or marked with other colours.

The gladiolus is one of the most effective plants for garden display in mixed groups of plants, the bold, bright flowers—borne on long spikes, and lanceolate leaves—harmonizing with most types of foliage. The flowers are specially useful for cutting, being highly decorative and easily arranged. If the blooms expand during hot, dry weather they do not last well, but the spike may be cut when the lower blooms are opening, and if placed in water in a well lighted room every bud on the spike will expand. The course usually adopted by florists is to cut the spikes, and place them in water on the appearance of the first flowers, and hasten or retard the opening of the blooms by admitting, or preventing admission, of light.

The most suitable soil is a rich friable, well-drained loam, although the plants will succeed fairly in heavy clay, or light sandy, soils, if well drained. The soil should be deeply worked and manured. Well decayed horse or cow manure is suitable, but no manure should be allowed to come into contact with the bulbs. For the production of exhibition flowers specially prepared beds are necessary. These should be in a fairly open position, sheltered if possible from north winds, but not over-shadowed or invaded by roots of large trees. Special attention to the manuring and working of the beds prior to planting will be compensated by specially fine spikes of bloom in season. The bulbs of the early varieties, of which "The Bride" is an example, may be planted during autumn in clumps or patches in the mixed borders, or in separate rows if grown in quantity. The bulbs of this class are small, and should be planted at a depth of about 4 inches. These may be left undisturbed for several years, in which case slightly deeper planting is advisable. About 3 inches apart in the clumps is a sufficient distance to plant. The Lemoinei varieties succeed the early kinds, and if planted during August or September will bloom about end of December. They will well repay special treatment, and as they make their growth, and bloom during dry weather, as a rule, require a fair amount of manure and water. The bulbs of this section should be planted at a depth of 6 inches, and should be lifted annually. The larger flowering kinds may be planted at varying periods from November to January. The bulbs of these should be planted about 1 foot apart and at a depth of about 9 inches, when grown in beds for exhibition. About 2 feet should be allowed between each row of bulbs. The beds should be mulched, and when the flower spikes appear the plants should receive a good supply of water if the weather is dry and hot. The plants should be staked as a protection against heavy winds. After the flowers are cut the usual practice is to let the plants finish their development without further cultivation. This practice is wrong, and is the principal cause of degeneracy in gladioli. The beds should be cultivated, and the plants kept green as long as possible, to insure a thorough development of the bulbs for the following season. After the plants die down, the bulbs should be lifted and stored in a cool dry place until the next planting season.

Although the gladiolus is usually termed a bulb, it is really a corm, *i.e.*, a solid bulbous root bearing a surface bud, new corms being produced on top of the old ones. As these corms increase they should be divided. They are also increased from the small bulbils that are produced at the base of the old corms, or at the ends of roots in some kinds. These should

all be saved and rowed out separately in season when the largest will probably bloom the same year, and the remainder the following season. They will be identical with the parent varieties. New varieties are raised from seeds. Seeds should be saved from the finest varieties, cross fertilized with the pollen of other fine distinctive kinds. Seeds should be sown in spring in beds or boxes of light soil, where they may be grown for the first season, afterwards being lifted and treated as the bulblets. Many will bloom during the second season after sowing the seeds.

A number of hybrid varieties is annually raised from seeds, and distributed when proved to be meritorious. There is, however, no check on the nomenclature of the gladiolus, as in the case of the rose, chrysanthemum, &c. A fair collection should include the Lemoinei, Childsii, Nancieanus, Kelwayi, and Gandavensis types.

Flower Garden.

Roses, dahlias, and chrysanthemums, grown for specially fine flowers, will require to be watered and fed with liquid manure, and the flower buds or shoots thinned. Frequent reference is made in these "notes" to the above plants, chiefly because they are the most popular among florists' flowers, thrive in most parts of the State, and are generally catered for at Horticultural Shows. The results of the treatment accorded them should also be an object lesson in special culture in any branch of agriculture or horticulture. One of the most important matters is the feeding of such plants with manure in a liquid form. Such an application is without doubt the most prompt and economical method possible. The plant food is applied to the roots of the plants in the only form that they can absorb it quickly, it spreads evenly to all parts of the root system, and in the preparation the various ferments that are needed to make it available at once occur. In some cases highly concentrated preparations are dissolved and applied at once to the plants. In others animal manures are employed, and although less pleasant in the preparation and application, are much cheaper and generally more effective than the chemical manures. Fresh manure should be used, dry old horse or cow manure being valueless. Cow manure is generally advised, chiefly because it is the *least harmful*, but it is not nearly as valuable for the purpose as fresh horse manure Drainage from stables and cow sheds is more valuable than either, but must be allowed to stand for a fortnight at least, and be highly diluted before being used. Liquid manures should be used very carefully, beginning with weak solutions and gradually increasing their strength. Occasionally an application of clear water is necessary. Soot, fowl manure, blood manure, and guano, are all valuable for making liquid manure, but, excepting soot, are liable to "burn" the roots unless used very carefully. All animal manures used in liquid form should be allowed to stand several days after "mixing" before being used. The usual plan is to place the manure in a sack and suspend it in a tub or other vessel, diluting the resulting liquid before application. About 30 lbs. of horse manure soaked in 30 gallons of water will, after standing for a week, produce liquid ready to dilute at rate of 1 part to 20 clean water.

Chrysanthemums and dahlias should be fairly forward and should be securely tied as need arises. Dahlias will need to be thinned in their growths and flower buds. Any lateral shoots that occur on the selected shoots should be removed to within a foot of the surface. The lower shoots may be allowed to grow and will produce fair blooms later on.

Roses started into growth during February should be kept growing steadily. The plants will be benefited by the application of liquid manure once a week. Where a number of weakly shoots occur they should be reduced to one or two. On the first appearance of mildew the plants should be "dusted" with flowers of sulphur, choosing early morning while the dew is on the plants for the application.

Carnation layers should be ready for removal from the plants, and may be planted out in their flowering quarters, or rowed out, to plant later. They should be attended to in regard to watering and cultivation should the weather be hot and dry. Seeds of hardy annuals, biennials, and various perennials, may be sown, and herbaceous plants divided and replanted.

Seedling pansies, Iceland poppies, and other plants raised earlier may be planted where it is intended they should bloom.

Kitchen Garden.

Ground should be prepared, if not already done, for the reception of various winter crops. In low, moist situations the beds for various vegetables should be narrow and elevated. With an early start, and narrow, well ridged beds, many kinds may be grown that would otherwise fail.

Growing crops will need to be kept free from weeds and be well cultivated, especially where water is not available.

Seeds may be sown of cabbage, cauliflower, early varieties of peas, and various saladings. Plants from former sowings may be transplanted. A dull day is most suitable for such work; if the soil is dry it should be watered a day or so previous to planting.

DESCRIPTION OF APPLE.

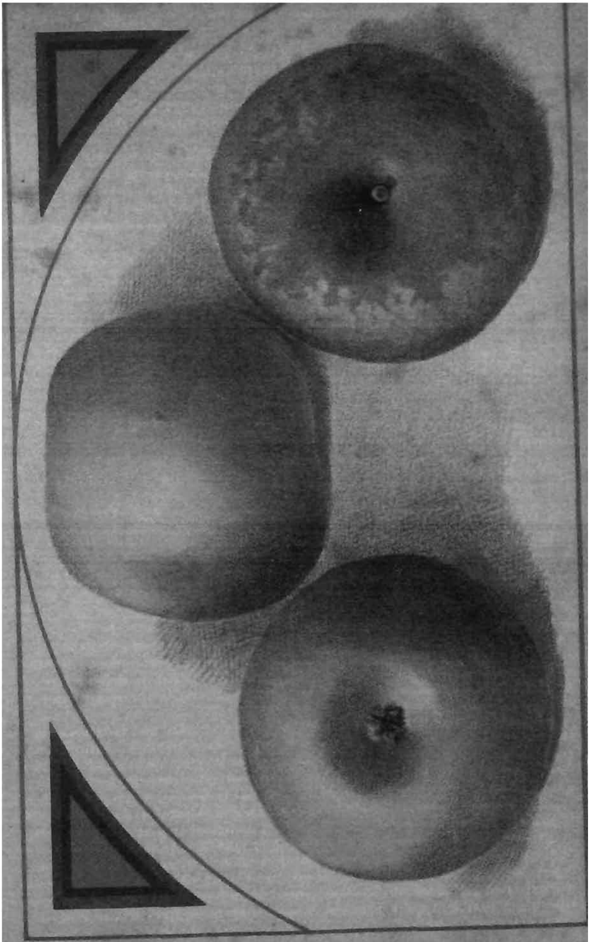
James Lang, Harcourt.

Newtown Pippin.

Fruit medium size; about 3 inches at the base, 2½ inches high, and sometimes oblique from the stalk. Skin greenish yellow, and occasionally a rich golden yellow, dotted over with minute russet dots. Eye closed, set in a shallow plaited basin; stalk short, inserted in a wide, deep cavity lined with russet, which entirely covers the base of the apple. Flesh yellowish white, tinged with green, crisp and juicy, with a rich aromatic flavour. Tree a moderate grower, and forms a large spreading head; crops well.

This is a dessert apple of the very highest excellence, and is considered by many experts to be the finest flavoured apple in cultivation. In season from April until October, being one of the best keeping varieties of apples we have. It is also one of the very best varieties for export, and should always be forwarded with the latest shipments.

It is an American variety, having originated at Newtown, Long Island, U.S.A. Downing says that there are two varieties of this apple, the green and the yellow, the difference being in colour only, but from the experience of the writer he is of opinion that there is only one variety, the difference in colour arising from the situation of the trees. In his own orchard, trees worked from the same stock show a marked difference in the fruit, some ripening a beautiful golden yellow, whilst from other trees the apples are always a greenish yellow.



GRANT TO AGRICULTURAL SOCIETIES.

The following details of the conditions under which the grant to Agricultural Societies will be distributed in the future are published for general information. Conditions A and B are compulsory, and either C or D must also be fulfilled.

A.—COMPULSORY—The prizes to be awarded in all classes of horse stock at the annual show shall be subject to an examination of such horses for soundness by a veterinary officer approved by the Minister.

(i.) APPOINTMENT OF EXAMINING OFFICER—

The veterinary officer is to be nominated by the Agricultural Society and approved by the Minister. The Department will pay his rail and coach fares in travelling to and from the show. Any professional fee charged for the examination is to be paid by the Society. At a limited number of shows each season the Minister will allow one of the veterinary officers of the Department to act, a fee of £2 2s. being charged for his expenses. In special cases, such as newly-formed societies or societies in out-of-the-way parts of the State, the Department may send the veterinary officer free of cost. Societies wishing to have the services of the veterinary officers of the Department must make application at least two months before the date of the show.

(ii.) METHODS TO BE OBSERVED ON SHOW GROUNDS—

a. In addition to the first, second, and third awards, the judges are to be instructed to place one reserve number in all classes where the entries are below eight, and two reserve numbers in classes where the entries exceed eight. No prize ticket to be handed out till after the veterinary examination.

b. A special steward to be appointed for each horse-ring to see to the transference of the placed horses from the judging ring to the veterinary ring, and to maintain their identity by numbers or otherwise.

c. A special veterinary ring to be provided to which all placed horses are to be brought for examination immediately on being judged.

d. A ticket steward to be appointed to attend in the veterinary ring and distribute the final award tickets on completion of the veterinary examination.

B.—COMPULSORY—That the Society takes an active interest in the work of agricultural education either by (a) arranging for the holding of agricultural classes with an attendance of at least 30 students, such classes to be conducted by the Department of Agriculture; (b) arranging a series of lectures and demonstrations, to be approved by the Department, on agriculture and live stock matters throughout the year.

(*a.*) AGRICULTURAL CLASSES.—The agricultural classes will last a fortnight, two lectures and demonstrations being given each afternoon, and four limelight lectures on evenings to be arranged for by the Secretary of each Society. The 30 students enrolled must be exclusive of school children. The rent of hall and all local charges are to be paid by the Agricultural Society; all other expenses by the Department. Arrangements must be made to insure the uninterrupted use of the hall during the time the lectures are going on, and tables or desks provided so that students may take notes. The conditions under which medals and prizes are

awarded to the students are to be subject to approval by the Department. One course each week is compulsory, the second subject being chosen by the local committee from the following list :—

FIRST WEEK.

Compulsory Subject.

The Principles of Agriculture.

Optional Subject.

One of the following :—(*a*) Sheep Breeding and Management (including Wool Classing and Lambs for Export) ; or (*b*) Dairy Farming.

SECOND WEEK.

Compulsory Subject.

The Care of Farm Animals.

Optional Subject.

One of the following :—(*a*) Poultry Breeding and Management ; (*b*) Agricultural Engineering ; (*c*) Orchard and Garden work.

SYNOPSIS OF LECTURES.

PRINCIPLES OF AGRICULTURE.

1. The plant food of the soil.
2. Cultivation methods and management.
3. Principles of manuring.
4. Valuation of artificial manures.
5. The management of the farm.
6. Experimental plots and their lessons.

Evening Lecture.—The Agricultural Resources of Victoria.

THE CARE OF FARM ANIMALS.

1. The structure and care of the horse's foot.
2. Brood mares and breeding mishaps.
3. Colic, constipation, and other bowel complaints.
4. Ailments of dairy cows—milk fever, impaction, udder complaints.
5. Some notifiable diseases—abortion, blackleg, tuberculosis, &c.
6. Ailments of swine, or ailments of sheep.

Demonstrations.

1. Examinations for age, lameness, and unsoundness.
2. Horse shoes and their uses—practical shoeing.
3. Castrating and operating.

Evening Lecture.—(Lantern)—The Points of the Horse.

SHEEP BREEDING AND MANAGEMENT.

1. The breeding of sheep for wool.
2. Wool sorting and classing, No. 1.
3. Wool sorting and classing, No. 2.
4. Raising fat lambs.
5. Management of flocks.

Evening Lecture.—The Wool Industry.

DAIRY FARMING.

1. Breeding and management.
2. Dairy buildings.
3. Dairy management.
4. Milk testing.
5. Foods and feeding.
6. Pig breeding, &c.

Evening Lecture.—Exported Products.

PRACTICAL POULTRY BREEDING AND MANAGEMENT.

1. The poultry industry: its importance. Locality—suitability or otherwise.
2. Housing (construction of, materials, insect proof, aspect, &c.). How to select stock.
3. Breeds: payable or otherwise, viz., eggs only. Breeds adapted for export—modes of crossing.
4. Turkeys: their care and management. Chicken raising and care.
5. Foods and feeding (practically demonstrated).
6. Common ailments of poultry (with demonstrations when necessary). Incubation—natural and artificial.

Evening Lecture.—Descriptive of Victoria's Progress during the last three years. (Illustrated with 90 lantern slides.)

AGRICULTURAL ENGINEERING.

1. Water conservation.
2. Irrigation.
3. Drainage.
4. Surveying and measuring.
5. Levelling and setting out.
6. Silo construction, making and using silage.

Evening Lecture.—Irrigation in Victoria.

ORCHARD AND GARDEN WORK.

1. Fruit growing: sorts and localities.
2. Manuring and cultivation.
3. Pruning and management.
4. Insect pests.
5. Fungus diseases.
6. The farmer's garden.

Evening Lecture.—The Fruit Industry.

Five of these lectures will be given in each course. The one considered least important for local conditions will be omitted.

(*b*) LECTURES ON AGRICULTURAL SUBJECTS.—Many of the lectures are illustrated by limelight views. The hall, advertising, &c., must be provided locally, free of cost, but all other charges are borne by the Department.

The course shall consist of at least four lectures or practical demonstrations during the year, and the Society must take sufficient interest in the matter to insure a good attendance. It is requested that application be made as early as possible, so as to permit of a complete syllabus being drawn up, and the subjects of most interest to the district are to be mentioned. The Department will arrange for the lecture to be delivered as

nearly as possible on the date mentioned by the Society, but modifications may be necessary in order to carry out the complete programme. The day of the week most suitable for each locality should be mentioned.

STAFF.

Veterinary Science, Stock Management, Dairy Sanitation—Messrs. Cameron, Colebatch, Robertson, and Paterson.

Agricultural Engineering, Surveying, Irrigation, Silos—Mr. Kenyon.

Principles of Agriculture, Manures, Cereal Culture—Mr. Lee.

Subjects connected with the Dairying Industry and Export Trade—Messrs. Crowe, Archer, and Carroll.

Orchard and Garden Work—Messrs. Luffmann, Cronin, and Campbell.

Sheep Breeding and Management, Lambs for Export—Dr. Brown and Mr. H. W. Ham.

Flax Culture and Demonstrations at Shows—Mr. Knight and staff.

Poultry Breeding and Management—Messrs. Hart and Hawkins.

Potato Culture—Mr. Seymour.

Cheese-making—Mr. McMillan.

Tobacco Culture—Mr. Temple Smith.

Pig Breeding and Management—Mr. W. Smith.

C.—*FIRST OPTION*. That the Society arranges for carrying out field experiments on an area and in a locality to be approved by the Department. These experiments shall be carried out by the *Department of Agriculture, and the expense, or a portion thereof,* shall be borne by the Society.

The plot of land should be about 5 acres in extent, so that the amount of produce may be of value to the Society. It is desirable also that arrangements be made for the use of the land for a number of years, so that a definite scheme can be worked out; the Society to furnish the land, with a written guarantee from the owner that it will be available free of charge to the Department. Members of the Society to plough, harrow, and do the main part of the cultivation. The Department will supply the manures and the seed free of cost, and superintend the sowing and harvesting, two-thirds of the produce to belong to the Society, and one-third to the Department. A committee of the Society to be appointed to arrange the details of the work in conference with an officer of the Department. This committee to inspect the crops at stated intervals, and to sign the report drawn up by the officer of the Department.

It is suggested that one or more experimental plots should be developed in each district. Three main lines of investigation may be carried out; first, the determination of the manurial requirements of the district; second, the introduction of new methods of management and of new crops; third, by introducing new varieties of crops not already grown in the district. A supply of seed will be forthcoming for distribution amongst members of the Society. The area of land selected should be typical of the district, if anything, rather on the poor side. The location of the plot should be such that it can be seen by as many farmers as possible. An area adjacent to the principal town, or close to the railway station of the district, is therefore suggested. The details of the experimental work carried on by the Department are published from time to time in the *Journal*, and will be furnished for the information of members on application to the Secretary for Agriculture.

D.—SECOND OPTION—A substantial prize, the amount to be approved by the Minister of Agriculture, shall be offered by the Society for improvements in farm practice or the cultivation of special crops in a district, the details to be approved by the Minister.

In carrying out this section, the words "substantial prize" are to be interpreted in proportion of the income and prize list of the Society. It should amount to from $2\frac{1}{2}$ to 5 per cent. of the total amount distributed in prizes at the show. The objects aimed at should be to make a distinct advance in farming methods as carried on in the district, and it will therefore be advisable to state the amount of the prize and the purpose for which it will be awarded several years in advance. Several Societies at present award prizes for the best-managed farms respectively under and over 200 acres; others for the best farm under irrigation. These Societies fulfill all the conditions required. Such subjects as—(*a*) The best 10 acres irrigated by a private scheme; (*b*) The best 5 acres of lucerne, maize, or other fodder crops grown with or without irrigation; (*c*) The best-managed dairy herd of ten cows or upwards; or (*d*) The best 5-acre crop of flax or beans, &c., &c. Two or three objects should be suggested by each Society in taking up this condition. The Department will, as far as possible, assist by arranging the details of the competition, give instruction as to the best methods in attaining the object sought, and, if required, an officer of the Department will judge the competition, and a full report, with criticisms and suggestions for improvement, will be forwarded along with the award.

STATISTICS.

Perishable and Frozen Produce.

QUARTERS ENDED 31ST DECEMBER, 1906 AND 1905, RESPECTIVELY.

Description of Produce.		Exports from the State.		Deliveries from the *Government Cool Stores.*	
		1906.	1905.	1906.	1905.
Butter	lbs.	23,995,196	19,624,117	17,525,704	14,072,968
Milk and Cream	cases	9,071	5,722	532	131
Cheese	lbs.	253,200	246,240	9,100	..
Ham and Bacon	,,	737,280	576,960	..	..
Poultry	head	21,260	18,630	3,042	3,210
Eggs	dozen	26,740	24,260	6,225	..
Mutton and Lamb	carcasses	589,166	421,021	117,264	94,720
Beef	quarters	2,368	850	..	..
Veal	carcasses	2,572	3,405	472	20
Pork	,,	385	448	15	303
Rabbits and Hares	pairs	110,910	288,276	44,118	114,670
Fruit	cases	24,211	13,442	..	108
Fruit Pulp	,,	1,554	2,253	..	..
Sundries	lbs.	..	..	19,671	18,961

R. CROWE, *Superintendent of Exports.*

Artificial Manures Acts.

SUPPLEMENTARY LIST OF UNIT VALUES OF MANURES IN THE MELBOURNE MARKET DURING THE 1907 SEASON.

Description of Manure.	Moisture.	Nitrogen.		Phosphoric Acid.								Estimated Total Value of Manure per ton.	Price asked for Manure per ton Delivered at Local Railway Station.	Where Obtainable.
				Water Soluble.		Citrate Soluble.		Insoluble.		Total.				
	Percentage.	Percentage.	Estimated Value in One ton of the Manure.	Percentage.	Estimated Value in *One ton* of the Manure.	Percentage.	Estimated Value in *One ton* of the Manure.	Percentage.	Estimated Value in *One ton* of the Manure.	Percentage.	Estimated Value in *One ton* of the Manure.			
			£ s. d.		£ s. d.		£ s. d.		£ s. d.		£ s. d.	£ s. d.	£ s. d.	
Mainly Phosphoric, Phosphoric Acid readily Soluble.														
Ordinary Superphosphate	4.44	..	..	19.90	4 0 7	1.16	0 4 8	0.86	0 0 10	21.92	4 15 1	4 15 1	4 5 0	Australian Explosives and Chemical Coy. Ld., Melbourne
15 per cent. Superphosphate	3.92	..	..	14.46	3 5 1	1.25	0 5 0	0.38	0 0 5	16.09	3 10 6	3 10 6	3 18 0	" " "
Concentrated Superphosphate	9.40	..	..	40.32	0 1 5	4.28	0 17 2	..	..	44.60	9 18 7	9 18 7	12 10 0	Colonial Manures Coy., Melbourne
Containing Nitrogen also.														
Nitrogenous Superphosphate	5.87	1.15	0 11 9	13.85	3 2 4	0.86	0 3 5	1.29	0 3 10	16.00	3 9 7	4 1 4	5 0 0	Australian Explosives and Chemical Coy. Ld., Melbourne
No. 2 Bonedust and Superphosphate	9.65	1.10	0 11 3	10.93	2 9 2	2.41	0 9 8	6.37	0 19 1	19.71	3 17 11	4 9 2	4 15 0	The Mt. Lyell M. and R. Coy., Melbourne
Bonedust and Superphosphate	8.45	0.80	0 8 2	4.00	0 18 0	4.50	0 18 0	9.10	1 7 4	17.60	3 3 4	3 11 6	4 15 0	J. A. Dundas, Footscray

SUPPLEMENTARY LIST OF UNIT VALUES OF MANURES IN THE MELBOURNE MARKET DURING THE 1907 SEASON—*continued.*

Description of Manure.	Moisture. Percentage.	Nitrogen. Percentage.	Nitrogen. Estimated Value in One ton of the Manure.	Phosphoric Acid. Percentage.	Phosphoric Acid. Estimated Value in One ton of the Manure.	Potash. Percentage.	Potash. Estimated Value in One ton of the Manure.	Estimated Total Value of Manure per ton.	Price asked for Manure per ton Delivered at Local Railway Station.	Where Obtainable.
			£ s. d.		£ s. d.		£ s. d.	£ s. d.	£ s. d.	
Mainly Nitrogenous.										
Sulphate of Ammonia	..	19.90	14 5 3	..	..	..	..	14 5 3	15 0 0	Australian Explosives and Chemical Coy. Ld., Melbourne
Nitrate of Soda	..	15.78	12 4 7	..	..	..	..	12 4 7	12 0 0	" " " " " "
Blood Manure	12.91	7.80	4 5 9	2.52	0 7 7	..	..	4 13 4	6 0 0	N. Dale, East Brighton
Mainly Potassic.										
Chloride of Potash	..	..	..	..	..	60.60	16 13 4	16 13 4	13 10 0	Australian Explosives and Chemical Coy. Ld., Melbourne
Sulphate of Potash	..	..	..	..	..	51.67	14 4 2	14 4 2	13 10 0	" " " " " "

Description of Manure.	Moisture. Percentage.	Nitrogen. Percentage.	Nitrogen. Estimated Value in One ton of the Manure.	Phosphoric Acid. Water Soluble. Percentage.	Phosphoric Acid. Water Soluble. Estimated Value in One ton of the Manure.	Phosphoric Acid. Citrate Soluble. Percentage.	Phosphoric Acid. Citrate Soluble. Estimated Value in One ton of the Manure	Phosphoric Acid. Insoluble. Percentage.	Phosphoric Acid. Insoluble. Estimated Value in One ton of the Manure.	Phosphoric Acid. Total. Percentage	Phosphoric Acid. Total. Estimated Value in One ton of the Manure.	Potash. Percentage.	Potash. Estimated Value in One ton of the Manure.	Estimated Total Value in Manure per ton.	Price asked for Manure per ton Delivered at Local Railway Station.	Where Obtainable.
			£ s. d.		£ s. d.		£ s. d.		£ s. d.		£ s. d.		£ s. d.	£ s. d.	£ s. d.	
Mixed Manure containing Nitrogen, Phosphoric Acid, and Potash.																
Orchard and Onion Manure, No. 1	2.78	1.96	1 8 1	14.25	3 4 2	0.99	0 4 0	2.32	0 7 0	17.56	3 15 2	7.58	2 1 8	7 4 11	7 0 0	Messrs. Cuming, Smith, and Co., Melbourne

Supplementary List of Unit Values of Manures in the Melbourne Market during the 1907 Season—*continued.*

Description of Manure.	Moisture.	Nitrogen.		Phosphoric Acid.		Mechanical Condition.						Estimated total Value of Manure per ton.	Price asked for Manure per ton Delivered at Local Railway Station.	Where Obtainable.
								Nitrogen.		Phosphoric Acid.				
	Per-cent-age.	Per-cent-age.	Estimated Value in One ton of the Manure.	Per-cent-age.	Estimated Value in One ton of the Manure.	Per-cent-age of Fine Bone.	Per-cent-age of Coarse Bone.	Per-cent-age in Fine Bone.	Per-cent-age in Coarse Bone.	Per-cent-age in Fine Bone.	Per-cent-age in Coarse Bone.			
Containing Phosphoric Acid and Nitrogen—Phosphoric Acid Difficultly Soluble.			£ s. d.		£ s. d.							£ s. d.	£ s. d.	
Bonedust	8.94	3.07	1 11 0	17.48	2 19 6	40.20	59.80	1.23	1.84	7.02	10.46	4 10 6	5 15 0	Australian Explosives and Chemical Coy. Ld., Melbourne
"	6.81	2.79	1 6 10	20.67	3 3 11	9.20	90.80	0.26	2.53	1.87	18.80	4 10 9	5 10 0	Exr. late T. Brown, Hamilton
"	7.80	3.95	1 19 0	19.17	3 2 2	24.50	75.50	0.96	2.99	4.69	14.48	5 1 2	5 5 0	N. Dale, East Brighton
"	9.13	1.41	0 14 5	19.05	3 6 5	48.35	51.65	0.68	0.73	9.25	9.80	4 0 10	5 0 0	J. A. Dundas, Footscray

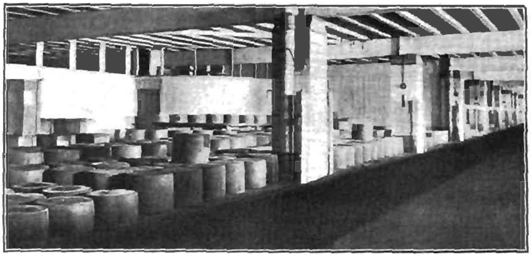
W. PERCY WILKINSON,
Government Analyst for Victoria, and Acting Chemist for Agriculture.

Government Laboratory,
Melbourne, 14th February, 1907.

CHEESE COMPETITION AT THE A.N.A. EXHIBITION.

JUDGES: JAS. SAWERS (Cheese Expert, New Zealand), J. G. MCMILLAN (Cheese Expert, Victoria), AND W. W. THOMAS (R. G. WILSON & CO.).

Although it was decided at the last moment to hold this competition, and consequently the notice was rather short, this was, perhaps, an advantage from the point of view of the industry as a whole. The number of



PORTION OF EXPORT CHEESE EXHIBIT.

entries proved very satisfactory, and, except in the export class, the cheese for exhibition was taken from the ordinary stock of the factory, there being too little time to prepare a special exhibit. The total number of entries was 94, but of these 12 were not forwarded, and 4 others arrived after the awards had been made. The specifications were as under:—

Class G: 1 ton export cheese, not over 3 months old.
,, H: 300 lbs. cheese, any age, not under 40 lbs. each.
,, J: 112 lbs. loaf cheese, any age, not over 12 lbs. each.

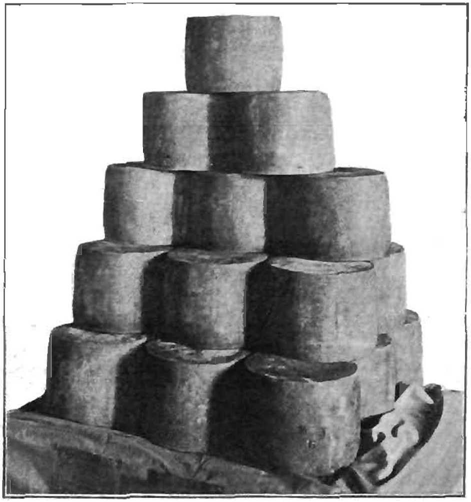
PRIZES AND AWARDS.

CLASS G.—*Prizes*:—1, Government Gold Medal, A.N.A. Exhibition Certificate, and £20; 2, £10; 3, £5; 4, 5, and 6, Certificates.

Awards.—1 and Championship, Noel Bros., Kolora. 2, Cobrico Cheddar Co-operative Coy. 3, Clachan Cheese Dairy, Cororooke. Very highly commended: Boisdale Butter and Cheese Coy., Upper Maffra Co-operative Butter and Cheese Coy., Newry, Warrnambool Cheese and Butter Coy. Highly commended: R. & J. Crothers, Edendale Factory, Wangoom, Sutton Grange Cheese Factory, Hugh Hennessy, Bena. A special prize of £10 is also to be given for the ton of cheese which arrives in London in the best condition for the English market, to be judged by an English expert.

CLASS H.—*Prizes*:—1, £5 and A.N.A. Exhibition Certificate; 2, £3; 3, £2; 4, 5, and 6, Certificates.

Awards.—1, Noel Bros., Kolora. 2, Bonnie Vale Dairy. 3, Clachan Cheese Dairy, Cororooke. Very highly commended: Sutton Grange Cheese Factory. Highly commended: Wolseley Park Co-operative Dairy Coy., New South Wales. Commended: Warrnambool Cheese and Butter Coy.



PORTION OF NOEL BROS.' EXHIBIT.

1st Prize and Championship of Australia, Class G.

CLASS J.—*Prizes.*—Same as for Class H.

Awards.—1, Cobrico Cheddar Co-operative Coy. 2, Bruthen Factory (J. Reid), Tambo Upper. 3, Sutton Grange Cheese Factory. Very highly commended: Wattle Hill Co-operative Cheese Factory. Highly commended: Peter Irvine, Orbost; Clachan Cheese Factory, Cororooke, McConachy Bros., Cororooke. Commended: Boisdale Butter and Cheese Factory, Wolseley Park Co-operative Dairy Coy., New South Wales.

The value of the prizes probably had much to do with the success of the exhibition, but another factor was, undoubtedly, the method adopted of judging on the point system. The adoption of this method would probably increase the interest taken in the cheese exhibits at the Royal Agricultual Shows, the educational value of the point system being every-

where recognised. The points awarded enable a cheese maker to see at once wherein he has achieved success, and also what is the nature and the extent of the defects in his exhibit. In judging each class it was thought inadvisable for each judge to act independently, as this would mean extra boring of the cheeses, and the less of this that is done, particularly in the export section, the better it is for the consignment. Mr. Sawers' opinion on each exhibit is valuable, as it enables our makers to form an

PORTION OF COBRICO CHEDDAR CO-OPERATIVE COY.'S EXHIBIT.

2nd Prize, Class G.

estimate of the quality of their cheeses as compared with the New Zealand standard for export.

The notes which are appended to the awards, when read in conjunction with the points awarded, will enable each exhibitor to know wherein he failed. Such criticism is intended to be of direct educational value, and it by no means implies disparagement. We are sure the different exhibitors will take the remarks made on their cheeses in good part.

The maximum points obtainable were as follow:—*Flavour*, 50; texture, 30; colour, 15; finish, 5.

It was very noticeable in nearly all exhibits that the curd had been taken from the whey in a soft condition. The judges agree that it would be advantageous to cut the curd smaller. When Mr. Sawers was at Terang

Class G.—Export Cheese, not

Catalogue No.	Competitor.	Points Awarded. Flavour, 50.	Texture, 30.	Colour, 15.	Finish, 5.	Total, 100.	Chemical Analysis. % Fat.	% Casein.	% Water.	% Salt.
138	Boisdale Factory	40.5	27	14	4.5	86	40.5	23.2	31.6	1.68
138A	Boisdale Factory	41	27.5	14	4.5	87	38.3	23.2	31.0	2.03
138B	Boisdale Factory	42	27.5	14	4.5	88	38.1	24.1	31.9	3.19
138C	Boisdale Factory	44	27	14	4.5	89.5	38.5	26.7	30.0	2.34
138D	Boisdale Factory	42.5	26.5	14	4.5	87.5	36.4	24.9	31.2	2.59
139	H. Hennessy, Bena ..	43.5	27	14	4.5	89	36.0	24.5	33.7	2.20
140	P. Irvine, Orbost	42.5	27	14	4.5	88	34.0	23.4	36.3	1.58
142	Upper Maffra Factory, Newry	43	27.5	14.5	4.5	89.5	37.4	23.2	36.3	1.60
143	Welshpool Factory, Welshpool	40	26.5	14	4.5	85	36.1	25.4	32.3	1.74
144	R. and J. Crothers, Wangoom	42.5	27.5	14.5	4.5	89	35.7	25.4	32.9	2.04
145	Cobrico Cheddar Co. ..	44.5	28.5	14.5	5	92.5	36.4	25.4	31.7	1.29
146	Clachan Dairy, Cororooke ..	41	27.5	14.5	4.5	90.5	37.0	23.2	34.0	1.63
147	B. Conlon, Terang ..	42	26.5	14	4	86.5	32.8	23.6	37.1	1.77
148	J. Baker, Foxhowe ..	40	27	14.5	4.5	86	36.4	24.8	33.0	1.44
150	J. J. Meredith, Larpent ..	42.5	27	14	4.5	88	33.7	24.2	35.2	1.35
151	McRae Bros., Larpent ..	42	26	14	4.5	86.5	36.0	25.2	33.2	1.67
152	McConachy Bros., Cororooke	43	27	14	4.5	88.5	35.3	25.8	34.5	1.30
153	A. McRae, Larpent	42	27	14.5	4.5	88	32.3	25.2	37.7	1.35
154	Noel Bros., Terang ..	45.5	28.5	14.5	4.5	93	34.5	26.0	30.2	2.06
156	Tandarook Factory, Cobden	40	26.5	14	4.5	85	34.8	25.4	33.3	1.64
157	Warrnambool Factory, Allansford	43	27.5	14.5	4.5	89.5	35.4	25.2	33.3	1.65
158	Sutton Grange Factory, Elphinstone	43	27.5	14	4.5	89	36.3	24.1	32.4	1.70

he complained of the curd knives being too wide between the blades, and recommended them being made much closer. With cutting the curd smaller a firmer bodied cheese is obtained. It is a great mistake to make the quality of a cheese suffer simply to obtain a large quantity. The aim of the cheesemaker should be, first, to obtain quality, then quantity. In the export class this defect was more noticeable, because the cheeses being of a large size, should be made firmer, as a soft curd is so liable to develop acid after salting. Cheese which we have termed "over acid" has not been too acid at the time of salting, but has developed it later on. One-inch threads in a soft curd may produce a more acid cheese than two-inch threads in a firm curd. Cooking more does not necessarily mean higher

OVER THREE MONTHS OLD.

Judges' Comments.

138 F. Not clean; little more salt wanted. T. Short. C. Irregular. F. Cloths too long, showing cracks in skin and mould.

138A F. Too much acid. T. Rough, body fairly close. C. Irregular. F. Good, but with same faults as 138.

138B F. Clean, but too acid. T. Rather short. C. Slightly bleached. F. Similar to 138 and 138A.

138C F. Fairly clean, but slightly acid. T. Short, but body soft. C. Irregular. F. Good shape; cloths rough on ends and too long; skins cracked and showing mould.

138D F. Clean, but too much acid. T. Short, body open. C. Irregular. F. Good, but with same faults as 138, 138A, and 138B.

139 F. Irregular, lacking cleanness as a rule. T. Short, body too soft; curd should have been cooked firmer. C. Dead. F. Fair; cloths too long, and badly pressed in on ends.

140 F. Fairly clean; more acid required. T. Body fairly close, but too soft; curd insufficiently cooked. C. Irregular. F. Fair; cloths too long.

142 F. Fairly clean; more salt required; cheese very green. T. Body fairly close, but too soft. C. Dull. F. Sides good, but cloths too long and not pressed into cheese, some out of shape, some good, others "off."

143 F. Strong, evidently due to contaminated milk; will get worse with age; more acid and a good deal more salt required. T. Short, and body soft. C. Irregular. F. Very nice, being clean and attractive; owing to soft nature, some out of shape.

144 F. Fairly clean, but rather insipid; more acid required. T. Body open, but velvety; get curd firmer. C. Fairly clean. F. Soiled; cloths too long and ruffled.

145 F. Lacked cleanness; more salt required. T. Body very close, but lacking silkiness; slight tendency to roughness. C. Good. F. Excellent; the finest looking lot in the Exhibition.

146 F. Good, but slightly bitter; a little more salt required. T. Body close, but too soft; should be firmer. C. Dull, owing to soft body. F. Good, but some cloths too long.

147 F. Without cheesy flavour, and lacking acidity; remedy for latter—cut curd smaller, allow it to be firmer in whey, and allow more acid to develop before salting. T. Body open and weak, lacking character. C. Dull. F. Bad, having rounded edges and being puffed; cloths too long.

148 F. Very strong, due to contaminated milk; more acid and salt required. T. Body fairly close, but too soft; more cooking necessary. C. Fair. F. Cloths too long and ruffled.

150 F. Tendency to bitterness; more acid and salt required. T. Body too soft and open. C. Dead, lacking brightness. F. Fair as regards skins, but sizes irregular; some cheeses out of shape.

151 F. Distinctly over acid; more salt required; curd was too soft when salted, acid developing afterwards. T. Short and rough; body soft. C. Irregular, due to excess of acid. F. Shape good, but cloths too long.

152 F. Some good, some "off"; more salt wanted; too much acid; it seems as if excess of acid had not been developed at time of milling, but owing to curd being soft it had developed in the curing room. T. Rough, owing to excess of acid; body fairly close. C. Dull. F. Fair; skins were good, but cheeses dirty.

153 F. Lacking in cleanness; more acid and salt required. T. Body soft and open; insufficiently cooked, if made firmer would have been of a different character. C. Fair. F. Skins smooth and clean, but cloths too long; some out of shape and size irregular.

154 F. Marked for cleanness and regularity. T. Body rather open, but with silky feel. C. Good. F. Cracks in skin, showing mould; cloths well put on, but too long; regular in size.

156 F. Considerably "off," evidently due to contaminated milk; additional acid would have counteracted ill effects of milk. T. Body fairly close, but too soft; curd insufficiently cooked, causing shortage of acid. C. Irregular. F. Good shape, but cloths too long.

157 F. Slightly bitter; would have been improved by firmer cooking and development of more acid; more salt required. T. Body fairly close, but rather soft. C. Dull. F. Cloths too long and cheese mouldy, but of good shape.

158 F. Wanting in cleanness. T. Body rather soft, but fairly close. C. Irregular. F. Good shape, but mouldy appearance.

temperature. Mr. Sawers recommends a longer time after milling before applying salt, and also more salt, $2\frac{1}{2}$ to $2\frac{3}{4}$ lbs. to 100 gallons milk.

In consequence of the judges having taken a different stand-point from that usually adopted in Victoria, the results of the competitions have come as a surprise to many. A number of prize-winners at other shows failed to score. One gentleman was incensed at some friend of his not getting a mention, but, on cutting, had to admit that the lot in question was unworthy of a prize. He still maintained, however, that such cheese would top the market. Unfortunately, this is the case. As long as a cheese is soft, no matter what the flavour, it will realize a price. Dairy produce salesmen and growers should discourage this class of cheese. By refusing

CLASS H.—CHEESE

Catalogue No.	Competitor.	Points Awarded.					Chemical Analysis.			
		Flavour, 50.	Texture, 30	Colour, 15.	Finish, 5.	Total, 100.	% Fat.	% Casein.	% Water.	% Salt.
159	Geo. Mathieson, Moyarra ..	44.5	28.5	14.5	4.5	92	39.1	26.9	27.2	1.78
160	Benambra Factory ..	42	28.5	14.5	4.5	89.5	30.8	27.3	34.9	1.78
161	Boisdale Factory	42	27	14.5	4.5	88	36.0	24.7	32.3	1.90
161A	Boisdale Factory	41.5	27.5	14.5	4.5	88	34.6	26.9	32.4	2.19
161B	Boisdale Factory	43	27.5	14.5	4.5	89.5	34.8	23.5	34.0	2.01
162	M. Dunlop, Koo-wee-rup ..	42	27	14.5	4.5	88	36.1	24.9	32.5	2.05
163	H. Hennessy, Bena ..	40	27	14	4.5	85.5	33.1	24.7	33.8	1.82
163A	H. Hennessy, Bena ..	43	27	14	4.5	88.5	35.7	24.7	33.5	1.72
164	P. Irvine, Orbost	43	27.5	14.5	4.5	89.5	33.8	24.3	35.5	1.58
166	Cobrico Cheddar Co. ..	42	28	14.5	4.5	89	36.4	26.7	30.5	1.45
167	M. McLennan, Cororooke ..	44.5	28	14.5	4.5	91.5	35.0	24.1	34.4	1.59
168	Gazette Factory, Penshurst	40	27.5	14	4.5	86	35.2	26.3	35.0	1.82
169	J. Baker, Foxhowe ..	41.5	28	14.5	4.5	88.5	35.1	26.3	32.9	1.95
170	Hay Bros., Colac	42.5	27.5	14.5	4.5	89	33.3	25.6	33.8	1.83
171	P. Kenna, Framlingham ..	43	27.5	13.5	4.5	88.5	33.7	25.8	31.7	1.81
172	Lower Gellibrand Factory, Princetown	43.5	27.5	14	4	89	33.3	28.0	30.7	1.80
174	K. McDonald, Noorat ..	43	27.5	14.5	4	89	33.5	24.5	35.5	1.65
175	McRae Bros., Larpent ..	43.5	27.5	14	4.5	89.5	32.7	26.0	33.1	1.77
176	Noel Bros., Terang ..	45	28.5	14.5	4.5	92.5	32.5	26.7	32.9	1.99
176A	Noel Bros., Terang ..	42.5	27.5	14.5	4.5	89	37.2	24.1	31.7	1.95
176B	Noel Bros., Terang ..	43.5	27.5	14.5	4.5	90	35.7	25.2	31.3	2.03
179	Leach Bros., Penshurst ..	41.5	27.5	14	4	87	36.09	20.6	33.7	1.79
180	Warrnambool Cheese Factory	43.5	27.5	14.5	4.5	90	36.0	26.0	33.7	1.69
181	Wattle Hill Factory, Princetown	42.5	27.5	14	4.5	88.5	34.0	26.3	32.9	1.72
182	*Lade Bros., Strath Creek* ..	*42*	*26.5*	*14*	*4.5*	*87*	*33.9*	*23.0*	*36.0*	*1.61*
183	Sutton Grange Factory ..	44	28	14.5	4.5	91	36.4	25.8	33.0	1.71
184	Manns Factory, N.S.W. ..	41.5	27.5	14.5	4.5	88	35.8	24.7	30.9	1.90
185	Wolseley Park Dairy Co., N.S.W.	43.5	28	14.5	4.5	90.5	35.2	23.0	32.8	1.76
186	Circular Head Factory, Tasmania	42.5	27.5	14.5	4.5	89	31.0	26.3	33.2	2.11

to have anything to do with such they will soon help in improving the quality. There is an outcry against a firm cheese, but it by no means follows that because a cheese is firm it is poor in fat. The variations in the percentages of the ingredients will be noticed in the analysis columns,

40 LBS. AND OVER.

Judges' Comments.

59 F. Very nice. T. Good, but rather open. C. Clear, but with tendency to irregularity at open parts. F. Fair.
60 F. Weedy, otherwise a good cheese; the milk supply should be looked into; a little more salt would improve flavour. T. Good, but lacking silkiness. C. Good. F. Soiled appearance, and cloths rough on ends.
61 F. Unclean. T. Body too soft. C. Dull. F. Cloths rough on ends, cracks with mould on outside. Could have done with more cooking and acid.
61A F. Decidedly strong; contaminated milk is evidently the cause. T. Close, but soft. C. Dull. F. Mouldy, and cloths too long.
61B F. Not clean enough. T. Rather soft in body and lacking silkiness. C. Dull. F. Outside of cheeses mouldy.
62 F. Lacking acidity; a whey smell due to too much whey being retained. T. Body very soft, owing to presence of whey. C. Fair. F. Fair, but soiled; improvement can be achieved by cooking better and developing more acid.
63 F. Distinctly "off," due to contamination. T. Too short, soft and open in body. C. Irregular. F. Cloths too long. Besides the dirty flavour, there was a lack of salt; curd not sufficiently cooked and lack of acid is responsible for body, the softness in turn is responsible for the irregular colour.
63A F. Fairly clean. T. Body too soft and open; more cooking of curd required. C. Irregular, due again to excess moisture. F. Nice, except for cloths being too long, and cheese wanting in good shape.
64 F. Fairly clean, but rather insipid; more acid and salt required. T. Body too soft; better cooking of curd necessary. C. Dull. F. Fair.
66 F. Strong, evidently from some fault in the milk; too little salt. T. Body close, but lacking smoothness. C. Dull. F. Cloths rough on ends and soiled.
67 F. Good, but lacking salt. T. Body close, but soft. C. Dull. F. Cloths too long; with more salt and firmness this lot would have scored higher.
68 F. Very much "off"; due to contaminated milk; strict examination of utensils and water supply should be made; also see that the milking is done cleanly. T. Fair, but soft. C. Irregular. F. Cloths too long.
69 F. Strong, evidently due to contamination of the milk. T. Good, but lacking silkiness. C. Very fair. F. Very fair.
70 F. Would be improved by developing more acidity in conjunction with better cooking. T. Body open and soft. C. Slightly irregular. F. Fair, but cheese a little out of shape owing to softness.
71 F. Fairly clean. T. Body close, but too soft; cook higher to obtain a firmer body. C. Very motley. F. Not good, cloths being too long.
72 F. Lacking in cleanness; could have done with more acid. T. Body open. C. Motley. F. Dirty looking appearance, and covered with dark mould; evidently knocked about in transit.
74 F. Slightly weedy; a little more salt wanted. T. Body open, but fairly firm. C. Fair. F. Bad, being covered with a dark mould; bad outward appearance.
75 F. Rather too much acid. T. Close in body, but rather rough. C. Slightly bleached. F. Fair, but cloths too long and outsides soiled; evidently the fault of this cheese is that salting was done in curd in too soft a condition, and insufficiently cooked.
76 F. Good clean. T. Body silky, but rather open. C. Good. F. Mouldy appearance and cracked skin, but of good shape and regular size.
76A F. Too much acid. T. Close, but lacking smoothness. C. Dull. F. Skin cracked and full of mould.
76B F. Fair, but beginning to go "off." T. Body close, but soft. C. Dull. F. Cracks in skin spoiled appearance.
79 F. Strong. T. Body soft. C. Irregular. F. Bad, with dirty appearance; more cooking and more acidity required.
80 F. Slight tendency to being strong. T. Body rather soft and inclined to be gritty. C. Dull. F. Mouldy appearance.
81 F. Slightly "off"; little more salt required. T. Body close, but too soft, due to insufficient cooking. C. Irregular. F. Dark appearance.
82 F. Weedy; more acidity and salt required. T. Body fairly close, but too soft; more thorough cooking required. C. Irregular; due to excessive moisture. F. Fair.
83 F. Hardly clean enough. T. Rather short. C. Tendency to irregularity. F. Good but soiled appearance.
84 F. Distinctly weedy; remedy is to take good milk only. T. Fair, but open in body. C. Good. F. Dirty appearance.
85 F. Lacking in cleanness. T. Good, but rather open. C. Rather high. F. Very mouldy; the finish spoilt this exhibit.
86 F. A trifle weedy. T. Short. C. Fairly good. F. Cloths too long.

and it will be seen that the softness is generally caused by excessive moisture. The consumer does not want to pay for moisture, and by glancing over the table he will find that, while thinking the softness was due to richness in butter fat, he was only paying for water. The variation in butter

Class J.—Loaf Cheese,

Catalogue No.	Competitor.	Points Awarded.					Chemical Analysis.			
		Flavour, 50.	Texture, 30.	Colour, 15.	Finish, 5.	Total, 100.	% Fat.	% Casein.	% Water.	% Salt.
187	*G. Mathieson, Moyana* ..	42.5	27.5	14.5	4.5	89	43.5	24.4	24.6	1.94
188	Benambra Factory ..	42	28	14.5	4.5	89	32.2	27.6	34.8	1.49
189	Jas. Reid, Bruthen ..	44.5	28	14.5	4.5	91.5	35.2	24.9	32.7	2.01
190	Boisdale Factory ..	42.5	27.5	14.5	4.5	89	35.9	26.0	31.8	2.33
190A	*Boisdale Factory* ..	42.5	27.5	14.5	4.5	89	36.0	25.2	30.5	1.87
190B	Boisdale Factory ..	43	27.5	14.5	4.5	89.5	36.5	24.7	29.6	2.39
191	M. Dunlop, Koo-wee-rup ..	41	26.5	13	5	85.5	34.9	24.9	33.6	2.06
192	J. Fitzpatrick, Heyfield ..	41	26.5	14	5	86.5	35.4	27.3	31.8	1.71
193	H. Hennessy, Bena ..	42.5	27	14	4.5	88	36.6	24.9	31.6	2.20
194	P. Irvine, Orbost ..	43.5	27.5	14.5	4.5	90	34.5	24.5	34.2	1.66
198	Toora Factory ..	40	26.5	14	5	85.5	34.8	24.3	33.7	1.67
199	*Welshpool Factory* ..	40	26.5	14	5	85.5	35.3	25.4	33.[illegible]	1.14
200	R. and J. Crothers, Waugoom	42.5	27.5	14.5	4.5	89	34.0	26.0	34.0	1.83
201	Cobrico Cheddar Co. ..	44.5	29	14.5	4.5	92.5	37.1	28.0	28.0	1.93
202	*Clachan Dairy, Cororooke* ..	4[illegible]	27.5	14.5	5	90	35.4	24.7	33.9	1.75
203	Glencoe Factory ..	41	28	14.5	5	88.5	36.1	25.4	31.3	1.85
204	Hay Bros., Colac ..	42.5	27	14	5	88.5	33.4	23.2	36.0	1.89
205	P. Kenna, Framlingham ..	43	27.5	14.5	4	89	34.2	25.2	32.8	2.07
206	D. and J. McRae ..	43.5	27	14	4.5	89	34.8	25.2	32.0	1.79
207	McConachy Bros., Cororooke	43	28	14	5	90	34.9	25.2	32.7	1.84
208	A. McRae, Larpent ..	42.5	27	14.5	4.5	88.5	33.1	25.6	34.3	1.50
211	Warrnambool Factory ..	43	27	14	4.5	89	37.0	25.6	32.4	1.80
212	Wattle Hill Factory ..	43.5	28	14.5	4.5	90.5	34.2	24.1	35.1	1.55
213	Lade Bros., Strath Creek ..	43	27.5	14	4.5	89	37.4	25.2	31.9	1.63
214	Sutton Grange Factory ..	44	28	14	5	91	35.4	26.3	30.2	1.89
215	Manns Factory, N.S.W. ..	42.5	27.5	14.5	4.5	89	35.6	25.8	32.6	1.72
216	Wolseley Park Co., N.S.W...	43	28	14.5	4	89.5	34.7	25.4	33.3	2.04
217	Circular Head Factory, Tasmania	43.5	27.5	14.5	4.5	90	33.5	23.6	35.4	1.91

fat was 12.7 per cent.; casein, 7.4 per cent.; water, 13.1 per cent. The values of the different cheeses will be obvious to every one.

In conclusion, it may be suggested that all agricultural and similar societies who have dairy produce exhibitions should award prizes only when merited. The habit of awarding 1st prizes to cheese where there is only one exhibit is a bad one, unless the cheese is worthy. Unless the exhibit comes up to a certain standard no prizes should be awarded. A visit to many of our country shows will show this system to prevail, cheese winning a prize that probably would not score 2nd-grade marks. The evils of such a system must be obvious to all.

NOT OVER 12 LBS.

Judges' Comments.

187 F. Two sizes of cheese; largest good, smaller distinctly "off." T. Body open. C. Dull. F. Fair.

188 F. Weedy, due to contaminated milk; little more salt required. T. Good, but lacking silkiness. C. Hardly clear enough. F. Fair, but dirty appearance.

189 F. Good. T. Silky, but too open. C. Dull. F. Fair; cheese knocked about in transit.

190 F. A little too much acid. T. Short. C. Slightly bleached. F. Cloths too long; cracks in skin mouldy.

190A F. Weedy. T. Too soft. C. Dull. F. Same faults as 190.

190B F. Improvement on Lot 190A. T. Inclined to be short. C. A bit dull. F. Same faults as 190 and 190A.

191 F. Bad; devoid of any cheddar flavour; more acid wanted. T. Soft body; more cooking required. C. Very motley. F. Good.

192 F. Too much acid; greater care should be taken with the milk, which has been allowed to become too acid before renneting. T. Short, rough. C. Bleached. F. Very good.

193 F. Slightly over acid. T. Short. C. Bleached. F. Fair.

194 F. Clean, but insipid; a little more acid should be allowed. T. Body open; curd should be cooked more. C. Dull. F. Fair.

198 F. Distinctly strong and "off"; causes, bad milk, insufficient acid and salt. T. Body soft and open. C. Irregular. F. Very good.

199 F. Very bad; causes same as 198. T. Weak; open body; curd insufficiently cooked. C. Irregular. F. Very good.

200 F. Weedy. T. Body open. C. Dull. F. Black on ends, and cloths too long; a little more acid in conjunction with higher cooking would have improved this lot.

201 F. Hardly clean enough in some cheeses. T. Body very good. C. Good. F. Irregular sizes, and dirty on ends.

202 F. Hardly clean enough. T. Close, but too soft; curd requires better cooking. C. Dull. F. Excellent.

203 An "off" flavour, evidently due to contaminated milk, otherwise cheese well made; inquiry should be made *re* source of milk.

204 F. Unclean; allow more acid. T. Weak open body; cook more. C. Irregular, owing to softness. F. Very good.

205 F. Fair, but a little acid. T. Body soft, and lacking smoothness; hardly cooked enough. C. Dull. F. Bad, having a dirty untidy appearance.

206 F. Too much acid. T. Rough. C. Bleached. F. Good but dirty on outside.

207 F. Rather too much acid. T. Body close, but wanting in smoothness. C. Bleached. F. Very good.

208 F. Not clean; more acid and salt wanted. T. Soft open body; more cooking required. F. Good, but a rather soiled appearance.

211 F. Over acid. T. Body open, and lacking smoothness. C. Bleached. F. Very good.

212 F. Fairly good, but hardly clean enough; a trifle more salt wanted. T. Too soft; more cooking would have considerably improved this lot. C. Rather dull. F. Cloths too long.

213 F. Fair, a little more salt and acid required. T. Body soft; the curd should be cooked a bit firmer. C. Irregular, due to softness. F. Fairly good.

214 F. Hardly clean enough in some cheeses. T. Body rather open, and without silky feel. C. Irregular. F. Good.

215 F. Weedy. T. Lacking silkiness. C. Rather dull. F. Good, but black appearance.

216 F. Lacking cleanness. T. Body close and firm, but not silky. C. Good. F. Bad, having a dark mouldy appearance.

217 F. Not clean enough; more acid wanted. T. Open, soft body; more cooking required. C. Dull. F. Cloths dirty, and too long.

The results of the competitions are highly satisfactory, and prove that cheese can be produced in this country to compete with that of any other country in the world. That Mr. Sawers should express himself in the highest terms on the exhibits generally should give an impetus amongst cheesemakers to produce the best article. The success of Noel Bros. has been almost phenomenal. They owe their success to strict attention to cleanliness, attention to every detail, a careful study of the work, and maintaining the cheeses at an even temperature afterwards. Let others but follow their example, and there is no fear of the ultimate result of the cheese industry in Victoria.

THE ORCHARD.

James Lang, Harcourt.

The export season for fruit is now in full swing, and, judging by the quantity of cool-chamber space engaged, the season promises to be a record one as far as this State is concerned. The quality of the fruit is good, the seasonable rains we had in the latter part of January and beginning of February having helped to swell the fruit to a good average size, so that there should be no complaint about undersize when it reaches Covent Garden Market.

The crop of apples this year is very much above the average, so that those growers who ship to oversea markets are likely to do better than those who realize locally.

Pears are still an unsatisfactory fruit to ship on account of the bad condition in which many consignments arrive; still, growers must persevere with small consignments until the conditions become more satisfactory. The chief difficulty lies in the temperature of the cool chamber, which should be as near as possible 35 degrees, and not exceed 40 degrees. Pears should be placed in a separate compartment, so as to be more under the control of the refrigerating engineer. The method of packing pears also requires attention; the best results so far have been obtained from those packed in trays. Three trays, tacked together by cleats at the ends, form a package about the same size as the bushel case. Each tray holds about 36 fruits, making 108 fruits in each package. There is no reason whatever why pears should not carry as safely, and arrive in as good condition, as apples.

The varieties which so far have given the best results are Winter Nelis, Josephine d'Malines, Beurre d'Anjou, Beurre Clairgeau, Vicar of Winkfield, and Broompark. There is a good market for pears in London provided they arrive in satisfactory condition; prices last year ranged from 10s. per case to 30s. per case. The shipping companies are now taking more care of the pear consignments than they have hitherto done, so that it is to be hoped they will be able to land pears in as good condition as they do apples. When they are able to do so, a very lucrative market will be opened up to pear growers.

It is very much to be regretted that the fruit-fly pest has obtained a footing in many Victorian gardens. On account of it being found in so many centres, the danger of it spreading throughout the State is very great, and, therefore, it is hoped that the Government Entomologist and his inspectors will be successful in their efforts to stamp out the pest. Orchardists should, in their own interests, assist the inspectors in every way, both in locating the pest and carrying out instructions in regard to its destruction, no matter how drastic they may appear to be, because, should the fly obtain a footing in our orchards, the result will be disastrous to the fruit-growing industry.

It has been the opinion of many growers that the fruit-fly could not live in Victoria on account of the cool climate, but this opinion has now been completely shattered, and we will be extremely fortunate if the pest is stamped out at the present time.

The great source of infection is the imported fruit from New South Wales and Queensland, and the question whether prohibition should not be enforced against soft fruits coming from infested States will now have to be seriously faced.

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THREE YEARS' PROGRESS IN AGRICULTURE.

T. Cherry, M.D., M.S., Director of Agriculture.

A general survey of Victorian agriculture during the past three years is a record of undoubted progress. Exports of farm produce have increased, and in every district there has been a corresponding appreciation in land values.

OVERSEA EXPORTS FROM VICTORIA.

Article.	Value of Exports during—			
	1903.	1904.	1905.	1906.
	£	£	£	£
Live Stock (Horses, Cattle, and Sheep)	57,261	81,429	128,625	174,725
Butter and Cheese ..	860,674	1,319,047	1,278,110	1,638,125
Wheat and Flour	74,742	3,050,708	2,628,264	2,763,987
Meats—Frozen	342,233	355,000	518,543	633,468
Wool	3,147,829	5,347,607	5,314,316	6,026,940
Hides and Skins	607,244	480,523	729,282	928,767
Tallow	46,499	93,177	137,656	204,776
Total of Seven Articles	5,136,482	10,727,491	10,734,796	12,370,788
Increase since 1903..	£7,234,306; or 140 per cent.			

Allowing for the special conditions during the South African War and the drought (which had a marked temporary influence on the exports of live stock and fodder), satisfactory expansion has taken place along every line of production. This is specially marked as regards wool, frozen lambs, and dairy produce.

The area of land actually under crop is about 3,200,000 acres, but the annual fallow has increased from 500,000 to over 1,000,000 acres, and the area under artificial pastures from 565,000 to 1,250,000 acres.

The more general adoption of the "rape fallow" system has had its effect on the fat lamb industry, and experiments are being tried by the

Department with the object of finding what crop can be best substituted for rape in districts where the rainfall is below 17 inches.

EXPORTS OF CERTAIN RURAL PRODUCTS TO OTHER AUSTRALIAN STATES.

Article.	Value of Exports during—		
	1904.	1905.	1906.
	£	£	£
Live Stock (Horses, Cattle, and Sheep) ..	729,175	861,848	1,166,826
Butter and Cheese	319,920	371,946	455,293
Bacon and Hams	120,253	97,730	133,642
Oats	62,214	97,680	109,255
Wheat and Flour	107,702	74,847	115,252
Hay and Chaff	48,061	95,938	136,366
Potatoes	27,485	107,503	179,349

General advance has been made in farm methods during the past three years. The yield of wheat has averaged 12 bushels per acre, as against 10.6 bushels in 1892-4, which were the three highest consecutive crops for any period during the past 20 years. This result is still more striking when it is considered that at the former period there was very little wheat grown in the Mallee. The advance in wheat is paralleled by similar advances in sheep, cattle, and dairy farming. The results now obtained are far more profitable than a few years ago. Part of this result is attributable to the use of phosphatic manuring and improved methods of cultivation and fallowing, and the greater number of live stock kept on farms is also producing its effect in keeping up the fertility of the land. Upwards of 15,000 farmers are now keeping flocks of sheep less than 2,000 in number, representing 43.5 per cent. of all the sheep in the State. It is this steady advance in mixed farming which is the best assurance of the permanence of our agricultural prosperity.

With this satisfactory record of progress there is, however, another side to the question. The number of live stock, especially sheep, horses and pigs, in Victoria has shown comparatively little expansion during the last 25 years; while the poultry industry is still looked upon by the majority of farmers as being too insignificant to be worth attention. We have not yet realized that it is the area under cultivation which determines the number of live stock that can be kept on a given farm and that on the whole it is essential to keep large numbers of live stock in order to maintain the fertility of the land.

With regard to wheat, while the yields appear to be increasing, there is no steady advance in the area under crop, which has remained stationary for the past eight years. The same remark is also true of oats, a crop which should be grown chiefly for consumption on the farm, in the shape of hay and grain, and of which comparatively little should be put on the market at all.

In regard to barley we find that the present area is less than half what it was in 1894, while the cultivation of peas and beans is only one-third of what is was 25 years ago. There is a widespread tendency amongst farmers to trust to the returns that they are able to obtain from grazing alone, and they have failed to realize that it is only by a combination of cultivation with grazing that the value of the grazing land can be gradually

raised. How great are the possibilities of expansion in Victoria may be seen from the fact that in the two central counties of Bourke and Grant less than 10 per cent. of the land is at present under cultivation; while in the Western district, comprising an area of 8,760,000 acres, only 236,000 acres (2.75 per cent. of the whole) are under cultivation, nearly half of which is located in the wheat-growing areas of the County of Ripon. Contrasted with this may be mentioned the Mallee County of Tatchera in which 40 per cent. of the private land is under cultivation each year. No doubt the difficulty of obtaining farm labour is one reason why land is allowed to lie comparatively idle, and it is a question worthy of serious consideration whether we have not in Victoria nearly reached our limit of production with the amount of labour at present available.

Two branches of the export trade alone—fat lambs and fresh pork—offer almost unlimited fields for expansion. The example of New Zealand shows what can be done by growing fodder for lambs on comparatively small areas, and it may be further mentioned that in Great Britain on the same area of land as Victoria, and in spite of its crowded population, the number of sheep is maintained at from 25,000,000 to 30,000,000—more than twice the number depastured on our comparatively unoccupied territory.

Direct Experimental Work by the Department.

Fodder Crops.

During 1903-4 special attention was given to the growth of fodder crops for the benefit of the dairymen living in the southern portions of the State. A large number of experimental fields, embracing every available class of green summer fodder crop, legumes, and root crops was established, to which various artificial fertilizers—singly, and in combination—were applied. The results were highly satisfactory as regards the production of heavy crops of green fodder for direct feeding or ensilage purposes. The various members of the Sorghum and Millet family, grown side by side under identical soil and climatic conditions, revealed wide differences of yield and feeding quality.

Comprehensive chemical analyses established information of great benefit to dairymen desirous of compounding an effective and economical ration for dairy cows. The superiority of the Amber Cane, Planters' Friend, Kaffir Corns (Sorghums), and Japanese Millet brought these crops into prominence, with the result that they rapidly took the place of less nutritious varieties hitherto grown.

Hay Growing.

Considerable attention was also given to the hay-growing industry in Southern Victoria, and nearly 100 experimental plots, embracing 24 separate manurial combinations, were established throughout Gippsland, the Western and Central Districts. The results established the fact that, while the dominant deficiency of the southern soils was phosphoric acid, the commercial forms of fertilizers supplying this ingredient were, alone, insufficient to meet the demands of heavy crops of hay. The addition of nitrogen in the forms of sulphate of ammonia and nitrate of soda in almost every case stimulated the yield, and left a material advantage in favour of a combined dressing. From a monetary point of view, it was effectively shown that an expenditure of 12s. to 15s. per acre in manures produced an additional yield of hay worth at a low estimate from 30s. to 40s. per acre.

WHEAT GROWING.

A marked step in advance was taken in 1905. The immediate necessities of the northern wheat farmer had been previously met by means of the lessons of the small experimental plots widely established throughout the grain areas, but there was a growing feeling that a more systematic and continuous series of experiments was necessary, during the course of which the problem of improving the general wheat yield of the State might be effectively studied. It was decided to approach the problem in three separate directions, viz.: by means of improved methods of cultivation, the intelligent use of artificial manures, and by improved varieties of wheat.

Arrangements were entered into with some 30 representative farmers throughout the principal wheat-growing districts to each furnish 10 acres of land for a term of seven years. The Department undertook to supply the seed, manures, and supervision, and to furnish an annual payment of £15. These fields were sown in 1905 with 40 varieties of wheat, and, moreover, included trials in deep cultivation, green manuring, and the growth of fodder crops.

RESULTS OF FIRST TWO YEARS' EXPERIMENTS.

The results of the first year's experiments (published in the *Journal*, March, 1906) were considered satisfactory; they confirmed previous manure experiments in a similar direction, and established the superiority of the superphosphate over other forms of phosphatic manures. The addition of nitrogenous and potassic manures was shown to be (at present) unnecessary. The yields of the wheat varieties indicated great possibilities, and many of them proved superior to the farmers' own wheat crops growing in the vicinity.

The following table shows the varieties producing the best results:—

—	Maximum Yield.	Minimum Yield.	Average Yield.	—
	Bushels.	Bushels.	Bushels.	
Federation	42.19	12.1	23.9	This average embraces the Wimmera, Mallee, Goulburn Valley, Central and North-Eastern Districts
Dart's Imperial	38.1	7.1	20.4	
Australian Talavera	39.0	9.1	20.3	
Jade	36.7	9.2	20.1	
Sussex	38.0	7.6	20.0	
Silver King	36.0	8.5	19.8	
Tarragon	40.0	9.7	19.7	
White Tuscan	35.0	4.8	18.7	
Frampton	33.8	6.5	18.4	
Marshalls' No. 3	37.6	5.2	18.3	
Farmers' Friend	28.3	8.0	17.9	
Majestic	30.0	8.3	17.0	
Purple Straw	32.4	4.1	16.9	
Fan	29.8	5.7	16.9	
Farmers' own seed	32.1	3.2	16.8	

The fodder crops were hardly a success, and did little more than emphasize the necessity of deep cultivation and constant after attention for this class of plant. In 1906, portion of these wheat fields was again sown with wheat varieties, the remainder of the field being put under three distinct methods of fallow, viz., ordinary bare fallow, rape fallow, and subsoil fallow. The results of the season just past are regarded as excel-

lent. Out of 38 varieties, there are no less than 14 showing superior yields to the seed provided by the farmer himself and sown on the plots, and no less than 16 varieties show higher maximum yields than the farmers' wheat.

The above varieties are the ones which gave the maximum yields in the first season also, which may be taken as evidence of their suitability.

In the coming season, the effects of the improved methods of cultivation will be demonstrated, and it is, moreover, intended to put the "Soil Packer" recently imported from America into operation.

IMPROVEMENT OF PASTURES.

A new line of inquiry, attempted for the first time in 1905, was the treatment of grazing land with artificial manures. Over 400 acres of medium to poor land, in areas of 5 acres each, have been treated throughout the Gippsland, Southern, Western, Central, and North-Eastern Districts, with a view of improving the stock-carrying capacity. Replies from experimenters to hand indicate that in the majority of cases they are well satisfied with the results of the trial, which has in no way interfered with the land, the manures having been merely harrowed in without disturbing the grass sod. It is expected that two or more years must elapse before the merits of this treatment can be decided, because as soon as the growth of the grass is stimulated the stock graze it down quickly. The manures showing the most favorable results so far are—superphosphate and bone-dust.

FODDER FIELDS.

The necessities of the dairyman and mixed farmer have not been lost sight of, and trials of fodder plants, grasses, legumes, and flax and onions are included in the 5-acre forage fields distributed throughout Southern Districts. The 5-acre fields are worked as miniature farms, and the operations of rotation, soiling, and grazing are carried out from year to year. In their own localities they serve a most useful purpose for trials with implements, manures, seeds, &c., and have excited considerable interest among the neighbouring farmers.

POTATOES.

Within the last two years especial attention has been given to the potato industry, and experimental plots of an acre each are situated in all the leading potato-producing centres. Some 30 imported varieties have been grown, some of which have given heavy yields. The distribution of seed from the best varieties is carried out every year, and, in time, the potato-grower will be furnished with some varieties of a more constant, prolific, and reliable type than some he is now growing. A special officer was appointed to superintend this work, and it is believed that the instruction which has been given in cultivation methods, and especially in regard to the steps that each grower must himself take in order to prevent the deterioration of the seed, will do much to maintain the industry in a flourishing condition in Victoria. Owing to the appearance of the potato blight in New Zealand, importations from that country have been prohibited.

ARTIFICIAL MANURES ACT 1905.

In 1904 and 1905 important amendments were made in the Artificial Manures Act of 1897, aimed at securing the protection of the farmer by the prosecution of vendors on detection of fraud. Another method was adopted

in the *Artificial Manures Act* 1905, which authorizes the regular publication of the results of analyses of all samples of manures taken in any part of the State, and the real value per ton of such manure. This amendment has brought the interest of the farmer in this respect into a most satisfactory state.

The cost of artificial fertilizers has steadily diminished in this State during the last five years. The most important artificial fertilizer used is superphosphates. A super valued at £6 18s. in 1900 now costs £5 3s. 6d., a drop of £1 14s. 6d. per ton to the farmer.

A further noteworthy fact is that superphosphates are cheaper in Victoria than in any other Australian State. The Victorian farmers get their phosphate manures just as cheaply as the American farmers, and nitrogenous manures cost the Americans half as much again as they cost the farmers of this State.

The quantity of artificial manures used in Victoria is increasing very rapidly, not only in the Northern wheat-growing areas, but also in all districts. The latest figures available show that it rose from 41,000 tons in 1903 to 54,700 tons in 1905. The estimated amount for 1906 is approximately 75,000 tons.

Development of Poor Land.

Experiments have been conducted on extensive areas of unprofitable land with a view of testing its capabilities under proper treatment and fertilization. At Stawell, on waste mining land, a fair crop of wheat and an excellent crop of hay, yielding up to 2½ tons per acre, has been grown with the aid of artificial manures. At Munro a wheat crop grown on sandy soil, hitherto considered as too poor for grazing, produced moderately successful returns, and it is intended to renew the test next season. Arrangements have been made to establish plots on the waste heath land at Portland, Casterton, and Foster (South Gippsland). The poor mining land between Beaufort and Ararat, and the light timber country to the north of Heathcote will also receive attention. The mountain country in Eastern Gippsland has produced excellent crops of oats, maize, and fodders, with the aid of manures, under the supervision of the Field Branch.

HEYTESBURY FOREST LAND.

A very extensive area of Crown lands, consisting chiefly of grass-tree country, has hitherto been looked upon as too poor for settlement. A small experimental farm was established eighteen months ago, 20 acres being cleared, drained, and cultivated. With the aid of a light application of artificial manures, chiefly superphosphate, good crops of oats, peas, maize, and roots have been grown. The chief difficulty to be overcome arises from the dense network of fibrous roots from the low scrub which grows on the land. This renders steam ploughing the only method by which the surface can in the first place be broken up. When exposed to the atmosphere for a summer the soil weathers into a friable sandy loam. The results obtained from the first year's operations have been such as to warrant the work of reclamation being undertaken on a larger scale. Accordingly, 1,000 acres have been drained and the clearing is now proceeding. Tenders have also been accepted for ploughing this area, and it is anticipated that the land will be ready for settlement early next year.

State Farms.

1. *Wyuna.*—In connexion with the subdivision of the Wyuna Estate, it was decided to establish a farm at the old homestead. The area is 500 acres, about one-half of which will be worked under irrigation, and the remainder by dry-farming methods. Substantial progress has already been made, 250 ewes, with their lambs, were fattened last spring, and there are now on the farm a herd of 50 dairy cows, with ample provision of silage and fodder crops to carry them on for several months. It is anticipated that this farm in the centre of one of the chief irrigation areas will prove of great value in enabling settlers on small areas of irrigated land to adopt sound and profitable methods from the start.

2. *Rutherglen.*—Attached to the Viticultural Station is an area of 800 acres of rather poor box country. It has been decided to work this as a general farm, and at the same time to utilize the buildings originally intended for a college as an educational centre for the orphans from the Neglected Children's Department. Twenty-two boys are now being trained to farm and vineyard work, and are at the same time receiving a sound school education. Preparations are now complete for receiving fifteen more boys. One hundred acres are cultivated, and there are 300 sheep and 70 cattle, chiefly dairy cows, on the farm.

3. *Whitfield.*—An abandoned block of 140 acres in the Whitfield Estate has been taken up, and the experimental tobacco farm formerly at Edi, a few miles distant, transferred to it. Before this farm can be developed it requires to be thoroughly drained. This work is now nearly complete. The experience gained at Edi proves that this district is well adapted for the growth of tobacco, broom corn, maize, and lucerne.

4. *Ballarat.*—An area of 120 acres has been transferred to the Department by the Ballarat East Town Council for a period of 21 years. The land is stringybark clay country, typical of all our chief mining centres. This farm will serve to show what can be done with a small area of land hitherto regarded as nearly valueless, or at the most only adapted for the growth of timber or fruit trees.

Agricultural Education and Pioneer Work.

The movement in favour of agricultural education is becoming deeper and more widespread, and there is ample evidence to show that it will prove a source of interest and profit not only by the lads on the farms but to older and more experienced men also.

Farmers' Classes were organized by the Department of Agriculture in 1902, when they were held in three centres. No classes were held the following year, but in 1904 the number of centres increased to seven, in 1905 to eleven, and in 1906 to eighteen. During the present year arrangements have already been made for conducting the classes in 26 centres. Last year the number of students enrolled numbered 1,320. The programme adopted this year comprises a fortnight's instruction, consisting of lectures in the afternoon, demonstrations in the morning, and illustrated lectures in the evening. The classes are arranged for by the Agricultural Society or a local committee, who have the choice of half the subjects lectured on each week. The present programme is, first week:—

Compulsory subject—"The Principles of Agriculture."
Optional subjects—Either (*a*) "Sheep Breeding and Management," or (*b*) "Dairy Farming."

Second week—

Compulsory subject—"The Care of Farm Animals."

Optional subject—One of (*a*) "Poultry Breeding and Management." (*b*) "Agricultural Engineering." (*c*) "Orchard and Garden Work."

These classes are already beginning to have an influence on the practice of agriculture in various centres. As an example of the effect of the practical instruction now given to farmers, it may be mentioned that small clips of wool are now often prepared for the market as carefully as those of large stations. Consequently, the price obtained by the farmer is proportionately much better than formerly. The development of the short courses of instruction for farmers promises to become a marked feature in agricultural education.

Agricultural High Schools will be opened at Warrnambool, Sale, and Wangaratta within the next few months, and active steps are being taken to establish others at Ballarat, Bendigo, Shepparton, and other centres. The conditions laid down for the establishment of these schools are that half the cost of the buildings shall be provided locally, together with 20 acres of land, and that an attendance of at least 50 pupils be guaranteed at a fee of £8 8s. a year each.

FLAX AND SUGAR BEET.

The calls on the services of the lecturers and experts of the Department are steadily increasing; such inquiries cover matters connected with drainage and the improvement of land, and the development of new lines of production for export. The cultivation of flax and sugar beet are two questions which have received much attention during the last twelve months. A large number of farmers are growing small areas of flax with good returns both from the linseed and fibre. A plantation has been established at Leongatha for the propagation of New Zealand flax, and it is hoped that in a few years a trade which represents £700,000 a year to New Zealand will become a profitable industry here also.

During the past three years experts have been appointed to take charge of the following branches of the Department:—Potatoes, poultry, cheese, sheep, and pigs.

The scientific work of the Department has been represented by further volumes of Mr. French's work on "Destructive Insects," and of Mr. McAlpine's on the "Rusts of Australia."

Dairying Industry.

For many years the importance of legislation to foster and control the Dairying Industry had been recognised. The passing of the *Milk and Dairy Supervision Act* 1905 promises to have great influence in raising the general standard of work amongst the farmers. Nearly all the recommendations of the Butter Commission are embodied in this Act. The educational aspect of the work has been emphasized, and the inspections carried out without friction. The Act has been in force in the Metropolitan Area, and in Ballarat, Bendigo, Castlemaine, and Geelong since 1st July, 1906, and it has recently been extended to 47 shires for the most part adjoining the milk areas. Already 25,000 cows have been examined twice, and the condition of each one, as to general profit and to freedom from disease of the udder, has been noted. The professional staff of this

branch now consists of a chief veterinary officer, three assistant veterinary officers, and sixteen supervisors. The latter are appointed after a thorough and searching examination as to knowledge and suitability for carrying out the requirements of the Act in a tactful manner. It is satisfactory to note that dairy farmers generally are welcoming the visits of the supervisors, and that there appears to be a *bonâ fide* intention to carry out the requirements as far as necessary improvements on the farms are concerned. This being the case, no orders or notices to enforce compliance with the Act have up to the present been issued. During the first six months of the operation of the Act, 313 cows reported by the supervisors were examined by the veterinary officers, with the following result:—Prohibitions removed, 157; prohibitions extended, 87; prohibitions made permanent, 69. The fees received for the same period amount to £2,358, and the expenditure to £1,988.

SILAGE.

The use of silage is progressing, the methods of making it put on a sound basis, and over 200 silos erected (70 of them by the Department on a system of deferred payments).

Experience during the past five years has shown that well-made silage is an economical and satisfactory food for stock, especially for dairy cows, and that many acres of wild oats and other kinds of undesirable herbage may thus be turned to profitable account. It is useful on the farm both in summer and winter, while as a provision for the next period of dry seasons in the North it is of as great importance as is the supply of dry fodder in the form of hay and grain. The results obtained where the silo has been properly filled under supervision of an officer of the Department have been such as to justify the expectation that this method of conserving fodder will come into general use throughout Victoria. Our experiments in this direction have attracted considerable attention, and a similar type of silo has been adopted in all the eastern States of the Commonwealth.

Live Stock Interests and Veterinary Work.

Of recent years there has been comparatively little in the way of epidemic diseases amongst live stock in Victoria, as of 489,879 cattle examined, only 647 cases were found; and of 200,088 pigs, only 659 suffered.

A scheme for a complete system of veterinary education and for the establishment of a stock institute in this State is now being considered. Practical demonstrations on veterinary work and the care and management of farm animals held in connexion with Farmers' Classes have attracted the greatest amount of attention. A further step towards improvement in the breeding of horses has been taken by the Department in requiring all stud horses to have passed a veterinary examination for soundness with regard to hereditary tendency to disease before being awarded prizes at agricultural shows.

The veterinary staff of the Department, which now consists of four experts, organized originally with a view of carrying out the provisions of the Milk and Dairy Supervision Act, is taking an active part by means of investigations into cases of disease, and by lectures and demonstrations, in furthering the live stock interests in these respects.

Development of the Export Trade.

The direct assistance to the export of frozen produce which has been given to the producer by the establishment of Cool Stores, and by the

GROWTH OF EXPORTS OF PERISHABLE AND FROZEN PRODUCE.

(Inclusive of Insurance and Freight.)

		1903.		1904.		1905.		1906.	
		Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
Dairy Produce—			£		£		£		£
Butter	lbs.	28,379,881 (12,669 tons)	1,270,000	37,948,216 (16,941 tons)	1,744,938	35,917,208 (16,034 tons)	1,763,789	45,865,022 (20,476 tons)	2,201,170
Cheese	,,	1,706,672	42,666	1,072,940	26,824	920,520	23,013	1,106,560	27,664
Milk and Cream ..	,,	2,041,400	42,529	1,325,500	27,614	1,645,700	34,285	2,061,200	42,941
Eggs	dozen	49,468	2,473	45,940	2,297	48,570	2,429	56,398	2,819
Poultry	head	119,375	29,844	46,820	9,364	51,705	10,341	72,720	14,544
Ham and Bacon ..	lbs.	2,876,995	83,912	1,530,600	44,643	1,708,800	49,840	2,388,600	69,667
Pork	,,	154,240	3,856	126,320	3,158	110,340	2,758	437,670	10,941
Veal	,,	617,040	7,713	1,320,300	16,503	928,055	11,600	706,515	8,831
Total ..	..	..	1,482,993	..	1,875,341	..	1,898,055	..	2,378,577
Meat—									
Mutton and Lamb ..	crcs.	275,290	165,174	302,539	181,523	551,938	331,162	858,718	515,230
Beef	lbs.	1,760,400	22,005	673,200	8,415	629,200	7,865	1,676,200	20,952
Total ..	..	..	187,179	..	189,938	..	339,027	..	536,182
Rabbits and Hares ..	pairs	3,501,097	204,230	4,045,036	210,679	5,142,928	267,860	4,761,766	248,008
Fruit—									
Fresh	cases	132,889	66,444	95,006	47,503	116,603	58,301	144,402	72,201
Pulp	lbs.	3,644,009	45,550	5,342,700	66,783	845,900	10,753	462,000	5,775
Total ..	..	..	111,994	..	114,286	..	69,054	..	77,976
Grand total ..	..	..	1,986,396	..	2,390,244	..	2,573,996	..	3,240,743

SUMMARY OF VALUE OF EXPORTS.

	1903.	1904.	1905.	1906.
	£	£	£	£
Dairy Produce	1,482,993	1,875,341	1,898,055	2,386,917
Meat	187,179	189,938	339,027	541,826
Rabbits and Hares	204,230	210,679	267,860	249,398
Fruit	111,994	114,286	69,054	81,143
Grand Totals	1,986,396	2,390,244	2,573,996	3,259,284

INSPECTION OF EXPORTED PRODUCE.

Year.	Grain and Flour.	Fodder.	Potatoes.	Onions.	Miscellaneous.
	bags.	packages.	bags.	bags.	packages.
1903	25,690	16,314	98,872	89,726	—
1904	472,132	36,202	19,753	19,736	5,243
1905	639,139	153,786	35,356	19,241	3,423
1906	775,160	149,660	225,693	24,240	12,255

educational work carried on by the Department, has been extended by the introduction of a complete system of grading. The grading was voluntary up to September, 1906, when the introduction of the Commonwealth Commerce Act made it compulsory. The preceding tables will give some idea of the proportions of the trade at the present time, and it may be mentioned that during the four months ending 31st January, 1907, about 17,000 consignments of butter alone were examined and graded by officers of the Department.

A contract with the White Star, Aberdeen, and Lund Lines, made in 1905, secured a reduction of 50 per cent. in the freight on frozen produce for three years. With the present volume of exports a reduction of the rate from ¾d. to ⅜d. per lb. is equivalent to a saving to the producer of £70,000 per annum. At the same time, the space available is enlarged, the temperature lower than ever before.

Early this year two Commercial Agents were appointed, for a period of three years, to promote trade between Eastern Countries and Victoria, Mr. J. M. Sinclair being sent to work in the Malay States, India, Burma, Java, Sumatra, &c., and Mr. Levien in Japan and China.

Many desirable connexions between Victorian Exporters and Eastern merchants have been established, and already considerable advantage has been gained. Mr. Sinclair has succeeded in persuading the Indian Government to try Victorian fodder for Army purposes, and a trial order has now been received.

Compared with other States, Victoria is at a disadvantage in its trade relations with such places as Singapore, Batavia, Malay States, and surrounding centres, as there is no regular shipping service from Melbourne to such ports, while both Sydney and Adelaide enjoy a three-weekly service. The Government is determined, however, that this disadvantage shall not continue, and has called for tenders for a monthly service of steamers, with a view to encouraging Victorian trade.

Viticultural Industry.

Both the number of growers and the area under vines have diminished somewhat during the past few years. The quantity of wine produced is remaining about the same, while there has been a great increase in raisins and currants.

Year.	Number of Growers.	Area.	Wine made.	Raisins.	Currants.
		acres.	gallons.	cwt.	cwt.
1903	2,347	28,374	1,547,188	35,534	3,722
1904	2,260	28,513	2,551,150	53,447	7,490
1905	2,253	28,016	1,832,386	30,295	5,974
1906	2,009	26,402	1,726,444	42,975	6,403

The principal centre of the wine industry is Rutherglen, and, unfortunately, this district is suffering from the ravages of the phylloxera. The only way to cope with this pest is to replant the vineyards with American resistant stocks, on which there are grafted European vines of the variety required. In the work of reconstruction we follow chiefly on the lines of the French vignerons. In consequence of the phylloxera, the yield of French vineyards fell from an average of about 1,300 million gallons in the seventies to 528 million gallons in 1889. It is now as large as it was before the onset of the disease, and in the chief wine-producing districts as much as 90 per cent. of the area under vines has been reconstituted. At the Viticultural Station, Rutherglen, the Department has undertaken the work of supplying the State with resistant vines. A small vineyard has also been replanted with the grafted vines with very successful results, the vines bearing most prolifically, and the wine produced is of high quality. Up to last year the number of vines grafted was greater than the requirements of the affected districts; but with the advance of the phylloxera there has been a sudden increase in the demand. It is generally recognised that the whole of the infected area must be replanted within a few years. Steps have been taken to meet this emergency as promptly as possible. A well-equipped grafting-house has been erected, and the nurseries greatly extended. At present there are 230,000 grafts, and 100,000 slips are in the nurseries, and the numbers available will be doubled next season.

It is necessary to have the land on which the resistant vines are planted deeply worked in order to insure successful growth. It is therefore proposed to supply the vines only to growers who will fulfil this condition, and at the request of the vignerons an officer has been appointed to superintend the work of reconstruction.

The Fruit Industry.

Since 1903 all branches of garden and orchard work have made steady progress. Satisfactory yields are obtained with greater regularity than formerly, and the systematic measures which are now taken against the different fungus and other pests have resulted in a general levelling up of the condition of the fruit when it reaches the market. Numerous in-

stances are now reported in which apple orchards are yielding from 700 to 1,000 cases per acre.

Cool Stores for Fruit.

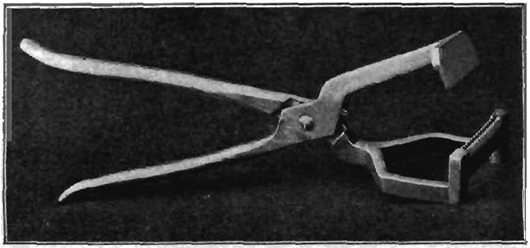
A store for the cool storage of fruit at Doncaster was erected by the Department in 1904, and the experience obtained last season indicates that the experiment will prove a decided success, the charges made being more than enough to cover working expenses, interest, and sinking fund.

Area under Orchards.

During the last ten years the area under orchards has increased from 45,000 acres to 60,000 acres, and much of the increased area is now coming into full bearing. In consequence, there has been an increased demand for the services of the inspectors of the Vegetation Diseases Branch. Practical demonstrations are regularly given by the staff in spraying and other means of combating orchard pests.

Oversea Export.

The export of fruit to oversea markets has increased from 12,000 cases in 1900 to probably 130,000 cases during the present season. As showing the extent of this market in the United Kingdom, it may be mentioned that in the year 1905 the value of the imports amounted to £11,000,000. Of this, Victoria contributed less than £25,000. As most of the fruit shipped to the United Kingdom comes from America and other parts of the northern hemisphere, where the apple season occurs at the opposite period of the year to ours, an immense extension of the fruit export trade may be easily attained.



KENDALL'S EMASCULATOR.

The above is an illustration of Kendall's Emasculator, which was referred to in the article on "Castration of Farm Animals" in the October, 1906, *Journal*.

DRAINAGE AND IRRIGATION.*

A. S. Kenyon, C.E., Engineer for Agriculture.

Cultivation without irrigation has been stated to be preferable to *irrigation without cultivation*, and there is no doubt that there is a great deal of truth in such a statement. In our State, careful and progressive farmers have raised larger and better quality crops than others have achieved with the same rainfall, and with the aid of irrigation water in addition. Much of the improved result was, no doubt, due to better cultivation methods; but these improved methods also meant, to a slight extent, drainage. The American teachers tell us that irrigation and drainage, or rather drainage and irrigation, are inseparable, drainage being the more important. Our experience, now that we have had some years of irrigation, is leading to the same conclusion. At Mildura, where irrigation on a large scale and to an extent replacing rather than supplementing the annual rainfall, was first put in operation, the early years did not teach the lesson, owing to the fact that, with other mistakes apparently unavoidable in the foundation of new occupations and industries, the varieties and classes of trees planted were not generally suitable either for the natural conditions or to give profitable returns. Seepage, of course, both black and white, early made its appearance; trees died out in the immediately affected parts, and general consternation ensued. Blame was, however, imputed to the leakage from the channels only, and not to the lack of drainage. Naturally, of course, the first evidences of over-saturation of the soil occurred near the channels, while the dying-off of trees in soils not giving surface indications of seepage, was ascribed to all sorts of other causes. Now that all the early inferior trees have been got rid of, and the limits of direct seepage from the channels ascertained, much more definite knowledge of the effects of over-watering is available, and a considerable amount of attention is being paid to the drainage problem. Shafts have been sunk through the surface sands, loams, and clays into beds of drift, and drains of various kinds led into them. These are only partially effective, and there is evinced a decided tendency to instal complete systems of tile or agricultural pipe drains, absolutely on the lines of old-world methods. The value of full-bearing, well-selected orchards in Mildura now reaches to over £100 per acre, so that the comparatively heavy initial outlay is not so severely felt.

The spectacle, however, of a country like the Mallee frontage to the Murray River, at Mildura, requiring sub-soil pipe drainage is sufficiently startling, and must inevitably give much food for thought to those engaged in either carrying on or advocating irrigation in our arid areas. Mildura has, like all the Mallee areas, soils ranging from almost pure sand to sandy clay, with beds comparatively near the surface of pure drift sand. The sub-soil is frequently almost pure rubbly limestone (so-called)—being generally the sulphate and rarely the carbonate form of lime—while in all cases lime in its various compounds is largely present. The "water table," save in beds of lagoons or swamps—where water collects in the rainy seasons—is generally at depths of 80 feet or over. The rainfall is on the average about 12 inches per annum only. The *contra* is necessarily the volumes of water used in irrigating. These are large,

* A paper read before the Adelaide Meeting of the Australasian Association for the Advancement of Science, January, 1907.

though probably not excessive, the average addition to the perennial crops, such as fruit trees, being about 24 inches net, *i.e.*, without allowing for water seeping from the distributary channels. Considering that there are many light showers which do not get into the sub-soil, the result of such heavy watering is equivalent to being in a zone of rainfall of about 40 inches per annum. Hence the raising of the water-table to within a few feet of the surface, injury to the growth of the trees, and the necessity for sub-soil drainage.

In the fruit-growing areas in the south, pipe draining is becoming more and more the rule, whether a limited amount of irrigation is practised or whether the natural rainfall alone is relied upon. Fruit trees show more quickly than any other crop the injurious effects of a shallow "water-table." In the Goulburn Valley, it will not be long ere drainage will be compulsorily resorted to by the orchardists. Already the warnings are being given. The evil day is being staved off by good cultivation, by "liming," and by careful and economical use of water. Even where, as at Bendigo, only comparatively small additions of water are made by the irrigators, the season just past—one of rainfall much beyond the average—has shown the need for drainage, many trees having either died or received a severe set-back.

So far, these remarks have dealt almost wholly with fruit trees, which receive considerable attention, much cultivation, and—most important—are watered by furrows and not by flooding. The case with regard to flooding irrigation is more marked. The almost invariable practice is to water all cereal crops, lucerne, and grasses by flooding. Apart from the injurious effects of submerging to a greater or less extent the growing plant, and preventing the natural processes of atmospheric action—markedly injurious under the high temperatures characteristic of our summer season—the inadequate preparation of the land calls for the application of a great excess of water to parts in order to cause the water to reach the higher lands. Consequently, the sub-soil is filled with water, and, especially where a "plough-pan" exists—as is usually the case in old cultivation ground—becomes water-logged and sour. The soil bacteria are deprived of their revivifying oxygen; their beneficial effects cease partially or wholly, and the soil becomes "adobe" or "brick." The sub-soil loses largely its capacity to retain moisture in its capillary or useful state, owing to the small particles cohering to form larger ones; within ten days or so, the crop shows signs of distress, and another watering—as wasteful as the previous—is required. Small wonder need be felt when assertions are heard that the life of lucerne is not more than five years—at other times, eight years is the statement—and that at the end of such a period, replanting is necessary. The cry that "irrigation does not pay" is justified by the results achieved under such methods.

It is not, of course, claimed that drainage, and drainage alone, will prove the sovereign remedy for all ills attendant upon irrigation. Far from it. Drainage is, however, a first essential, and the irrigationist employing or introducing drainage will rarely be found deficient in other respects. For orchard lands, and for like crops where the capital value of the producing land is high, there is nothing to excel the tile or agricultural pipe system. Its cost is high, as much as £6 or £7 per acre, though its general adoption should lead to the establishment of tile-making works in the locality, and consequent cheapening of the tiles. Besides, a complete system is necessary for trees and vines, it is a matter

of life and death; lucerne, although a deep rooter, is rather a gross feeder, while the annuals are content with a much shallower root system. They do not need such a perfect system as the orchards. For them a system sufficient to keep the soil bacteria lively, to keep the soil particles small, and to prevent the accumulation of the soluble salts—principally soda and lime—at the surface by capillary action, should suffice. Such a result should be capable of attainment by, first, better methods of watering—the use of furrows for watering or properly graded and small checks, if flooding be adhered to; secondly, by sub-soiling—breaking up of the "plough-pan"—and allowing the water into the sub-soil, along with its fertilizing agencies; and, thirdly, combining with the sub-soiling a few open or closed drains to insure movement of the water in the sub-soil. Such a system, on a very elaborate scale, is employed at the Werribee Sewage Farm, Melbourne, and has proved highly successful both from the financial and hygienic stand-points, in dealing with a most difficult problem—the disposal of large volumes of sewage matter, which, unless an efficient system of drainage were in vogue, would form most objectionable and useless marshes.

In our shallow soils, with sub-soils of a highly clayey nature, great care must be taken in sub-soiling not to bring much—none, if possible—of the sub-soil to the surface, as the sub-soil, though chemical analysis shows it practically as rich in plant foods as the surface soil, is known by bitter experience to be useless to plants for many years. The effect of sub-soiling to a considerable depth upon the unlocking of these unavailable plant foods is a problem which, apart from the question of drainage, offers considerable allurement to the investigator, and profitable returns to the community, should it be successfully solved. It may be predicted that sub-soiling, combined with proper surface cultivation and sub-surface packing, will render as much service to our farming community as the introduction of phosphatic manuring.

Experiments to determine the movements of the soil moisture in the surface and sub-soils are being carried on at the Wyuna Government Irrigation Farm in the Goulburn Valley District, Victoria. Samples of the soil at the surface, and at every 6 inches in depth down to 2 feet, are taken at frequent intervals of time, depending upon climatic conditions, to ascertain the amount of moisture present. The samples are taken from virgin land of various classes, land cultivated on ordinary methods, land subsoiled, and land irrigated, embracing as far as possible all cases of variation of soil moisture movements due to man's interference. These investigations are, as yet, in their initial stages only; but they promise to yield much of interest.

Reference has been made above to American ideas as to the relative importance of drainage and irrigation. An authoritative Indian Commission on the effects and causes of alkali in the Aligarh district of Northern India reported in effect that the introduction of irrigation increased the alkali areas, both by seepage from the channels, and by excessive use of water in irrigating, and that where the removal of such excess waters was mainly due to evaporation, the result was a destructive accumulation of alkali. The remedy proposed by the Commission was subsoil drainage. Apart from the injury to the productive power of the soil, much ill effect on the health of the residents has been caused throughout the irrigation districts of India. "The high fever death rate is largely due to the stagnating water in the soil." Mr. D. H. Anderson, editor of the

Irrigation Age, Chicago, says:—"The constant pouring of water upon the soil in many of the older irrigated districts has resulted in creating a water table near the surface; so near, in fact, that formerly fertile tracts of land have become converted into swamps. Hence, drainage has become a problem necessary to be solved if fertile lands and profitable orchards are to be saved from destruction, and it is gradually dawning upon the minds of irrigators that where there is a system of sub-irrigation there is also a system of drainage ready to hand. . . . According to the common understanding, drainage means carrying off an excess of water from swamps and cold, over-moist soils for the purpose of reclaiming them or converting them into fertile fields. But since irrigation plays so important a part in farm economy and profitable plant culture; indeed, since it has become an absolutely essential element of success in the arid and sub-humid regions of the United States, and is gaining ground in the humid regions, it has been discovered, through costly experience, that drainage and irrigation are inseparable systems."

One further factor in the problem remains to be considered. Our older schemes of irrigation were almost wholly designed upon the principle of carrying water to the land along the ridges or high ground, and above the level of the land to be watered—in fill, to use the technical term. No, or but little, provision was made for drainage of surplus waters, the channels, as constructed, being manifestly unfitted for such use. Neither is there legislative provision whereby an irrigator can obtain an outlet for his drainage system through the land of another owner. In the reticulation of the Wyuna Settlement, an area of about 20,000 acres—the latest system of distributary channelling carried out in Victoria—ample provision has been made for drainage channels in the low lying ground to carry off the surplus waters, though not providing for each individual irrigator's requirements. The need for the construction of collective drainage works and for legislation for the individual's needs, will not, however, arise until such improved methods of irrigation have been adopted with such consequent great improvement in profits that the cost will not prove so great a burden as it at present appears.

The experience of all other irrigating countries warns us that it is essential to drain to achieve the best results. In laying out the farm, as well as the great State schemes, this fact should be borne in mind, and ample provision made. The result will be less water required for irrigation, and much greater profits. Already we know that as great profits can be achieved here, as in any other country; that areas supporting a few sheep can be made to support as many, nay, more, men; and that living can, in our once arid inhospitable regions, be made a joy instead of a punishment; but this can only be done by the use of much labour, and of the best methods of irrigation, of which drainage is not the least important.

THE COACH-WHIP BIRD.

Psophodes crepitans (Vigors and Horsfield).

C. French, F.L.S., F.E.S., Government Entomologist.

This valuable insectivorous bird is generally found in the deep gullies and creeks at the foot of the mountains, and is very shy. Its well-known note, resembling the cracking of a stockman's whip, can be heard in the

Dandenong and other ranges within easy distance from Melbourne, also on the Dandenong, Olinda, and other creeks. In fact, in the southern part of Victoria, especially in the mountainous country, it is a fairly common bird, and lives on all sorts of noxious insects and their larvæ; the native slugs also constitute part of its food. The nest is an open structure, composed of small twigs, bent round and lined with Cassytha and other wiry plants, also rootlets and bark. It is about 2 inches in depth, and generally placed a few feet from the ground in very thick undergrowth. On the Dandenong Creek nests are often placed between the forks of the tea tree (*Leptospermum*), and as the twigs composing the nest resemble those of this tree it requires a very keen observer to discover it. Two eggs usually constitute a set; they are of a beautiful bluish-white colour, blotched all over with black markings, and, according to Mr. A. J. North, usually measure 1.07 x 0.77 inch. In New South Wales the eggs appear to be much darker in colour and larger than those found in Victoria. In this State the breeding season is generally October, November, and December; but, according to Mr. A. J. Campbell, eggs have been taken in July. According to Mr. A. J. North, the coach-whip bird is found in Southern Queensland, New South Wales, and Victoria. The following description is taken from Gould's *Birds of Australia*:—

"Adult Male.—Head and nape black, remainder of upper surface olive-green; upper wing-coverts like the back; quills dusky brown, the outer primaries narrowly edged with brown, the remainder, also the secondaries, margined externally with olive-green, increasing in extent towards the innermost secondaries, which have both webs olive-green; central tail feathers olive-green, the remainder blackish-brown, washed with olive-green on their outer webs, but less distinctly on the three outermost feathers on either side, which are tipped with white; lores, feathers below the eye, ear-coverts, and sides of the neck black; cheeks and sides of the throat white; chin, centre of the throat, and breast, black; some of the feathers on the throat slightly edged with white, and those on the centre of the breast and abdomen broadly tipped with white, forming a conspicuous patch; sides of the body and abdomen ashy-brown, slightly washed with olive-green; under tail coverts dull olive-green; bill black; legs and feet dark reddish-brown. Total length in the flesh 10.75 inches, wing 3.7, tail 5.75, bill 0.8, tarsus 1.25.

"Adult Female.—Similar plumage to the male."

Mr. A. J. North, in his valuable work, *Nests and Eggs of Birds found breeding in Australia and Tasmania*, has the following interesting note regarding the coach-whip bird:—"The note of this species, from which it has received its vernacular name, is uttered by the male, and resembles 'chuk chuk,' followed by a rather prolonged and gradually rising hissing whistle, terminating in a loud, clear, and vigorous 'wh—p,' the female answering immediately with a 'chuk chuk,' which would lead one to imagine that the response was part of her consort's note. Occasionally it is varied with a low squeaking or whining note, common to both sexes. In autumn the male usually utters only the beginning of his call, and does not conclude with the whip-like sound."

This is a bird which should be encouraged wherever seen, as it ranks amongst the most valuable, for its size, of our insect-destroying birds.

C. C. Brittlebank, del. C. French, direxᵗ R. S. Brain, Govᵗ Printe

"THE COACH-WHIP BIRD."

(Psophodes crepitans, – Vigors and Horsfield.)

LAMENESS IN HORSES.

S. S. Cameron, M.R.C.V.S., Chief Veterinary Officer.

Definition and Description. Habit lameness. Reflex lameness. Detection—during rest, during movement, lameness in front, lameness behind, cross lameness. Diagnosis of obscure lameness—local anæsthesia. Shoulder lameness—shoulder slip, sprain of the flexor brachii or biceps muscle, shoulder joint injury. Elbow lameness. Capped elbow. Knee lameness—sprain of superior check ligament, thorough-pin of knee, speedy cutting, spavin of the knee, capped knee, broken knees. Sprain of the "back tendons"—the inferior check ligament, the tendons of the flexor muscles, the superior sesamoidean or suspensory ligament. Splints. Sore shins. Fetlock lameness—arthritis, sesamoiditis. Wind galls. Knuckling over. Pastern lameness—sprain of the inferior sesamoidean or suspensory ligament, break-down, split pastern, ringbone. Foot lameness—sidebone, corns, laminitis or founder, villitis, navicular disease. Lameness in the Loins—sprain of the lumbar muscles, sprain of the psoas muscles. Hip lameness—sprain of the gluteal muscles, hip joint injury, fracture of the pelvic bones. Stifle lameness—dislocation of the patella. Lameness in the gaskin. Hock lameness—thorough-pin, bog spavin, blood spavin, bone spavin, curb. Contracted tendons and knuckling over. Rheumatic lameness. Shivering. Stringhalt. Internal lameness.

DEFINITION AND DESCRIPTION.

Lameness (A. S. *lem* or *lama* = weak) may be understood to be imperfection of action of a limb or part. It is not in itself a disease but is a sign, manifestation or expression of pain, weakness or inability in one or more limbs or parts concerned in locomotion. It is usually a sign of disease but is not necessarily so, for lameness may exist for some short time from the pressure of a stone on the frog or from a tight-fitting shoe or from a nail driven too close to the "quick," simply as the result of pain alone without disease. It may be also that lameness while resulting from disease is not indicative of pain, as in the case of anchylosis (welding together of the bones) of the hock joint, in which case there is marked lameness from stiffness or inability to flex the joint, but no pain. Conversely in some cases of stiff joint there may be extensive disease but no pain or lameness; this occurs in connexion with joints in which there is ordinarily not much flexion—for example, the lower pastern joint when affected with a "set" ringbone. Again, while it may be generally taken for granted that lameness is a sign of pain or disease or both, this is not always the case; for instance, a stone may become wedged between the frog and the shoe and cause imperfection of action, not because it must necessarily give rise to pain, but because the thickness of the stone raises the foot above its fellow, and makes the horse limp. Here it may be well to intimate that lameness, whether arising from disease or not, or whether caused by pain or not, is regarded legally as unsoundness.

Habit Lameness.

Peculiarity or habit of gait must not be confounded with lameness. A horse, especially a youngster, when trotted and held short by the head on the near side will move with a "left-shoulder-in" kind of action, and on account of more weight being thrown on the side to which the head is

turned he will appear to favour the off fore limb as if he were lame on it. Army and police and riding school horses, from being exercised in a circle, acquire a habit of throwing more weight on the "inside" limb and consequently appear, even for a time when trotted straight, to be lame on the "outside" limb. These peculiarities or habits, by which the inexperienced are apt to be deceived, are called "bridle lamenesses." The often-observed "three-cornered walk" of lazy young horses when going down hill is merely awkwardness of action; the animal seems to slide along with the body swaying to one side as if he wanted to get down the hill hind-quarters first, but a touch of the whip or spur will arouse him sufficiently to prove that it is not lame action, but only slovenly habit.

Reflex Lameness.

Sometimes the cause of lameness is not in the limb or part in which the lameness is manifested, but in an organ or part more or less remote, as is seen in lameness of the off shoulder from liver disease, in which case there is always an associated yellowness or jaundice of the lining of the nostrils and eyelids. In some diseases of the brain and spinal cord and of the heart and arteries there is lameness from what is termed "reflex pain," that is, pain felt in the limb but transmitted by reflex nervous action from the seat of disease. Another instance is lameness of the near hind limb from disease or enlargement of the spleen, in which case the advancement of the limb, by forward pressure on the flank and abdomen, causes pressure on the affected spleen (or other abdominal organ, as the case may be), and consequent pain and halting action, the limb being "stopped short" in the act of advancement.

DETECTION OF LAMENESS.

Lameness may be manifested *when at rest* as well as *when in motion*. Indeed, some forms of lameness are apparent in some stages only when the animal is at rest, the merest movement being sufficient to do away with all signs of it. *It is consequently always advisable to see the horse* in the stable before commencing the examination proper.

Examination when at Rest.

It is important to observe the position in which the limb is placed when standing, for oftentimes the attitude is a valuable indication of the seat of lameness and in some cases actually diagnostic (*i.e.*, whereby it may be definitely determined or ascertained). The lame limb is usually held more loosely, from a desire to avoid pain; less weight is thrown upon it, and when tapped unexpectedly from behind the joints will slacken perceptibly. In the great majority of cases the pastern of the lame limb will be more upright and that of the sound limb will be more oblique than natural, on account of the correspondingly increased weight to be borne.

LAMENESS IN FRONT.—*In fore lameness, when a horse "points"*—that is, stands with the lame limb in advance of the sound one with the toe resting on the ground and the heel slightly raised—it generally indicates that the seat of lameness is below the fetlock; but if he places it in a line with the sound limb, or behind it, the disease can be relied on as

being above the fetlock. When both fore feet are "pointed" alternately, navicular disease or some lameness involving both feet may be suspected. In shoulder lameness, the limb is allowed to swing semi-pendulous, and the foot rests behind its fellow. In elbow lameness, the elbow is usually depressed, the knee greatly flexed with the foot either level with or behind the other. In founder (laminitis) of the fore feet, both are thrown forward at one time with the weight borne on the heels, and the hind feet are at the same time advanced to partly ease the strain of weight on the inflamed and painful fore feet. In this case, the horse rests on the heels because the inflammatory pain is in the region of the toe or front part of the hoof, while in navicular disease the seat of pain is in the navicular or shuttle bone at the back of the coffin bone (*os pedis*) towards the heel, which is consequently raised to relieve the strain of the tendon passing over and pressing on the diseased navicular bone.

LAMENESS BEHIND.—When lame behind, if the foot is placed in advance of its fellow, the lameness is below the hock. If the lameness is in both hind feet, they are advanced and the fore feet are placed nearer the centre of gravity. Disinclination to urinate on account of inability to "stretch" without pain is often evident in stallions and geldings when lame in both hind feet; and death from uræmic poisoning, preceded by acute fever, may result from the retention of urine so caused. To avoid this it is often advisable, in laminitis and other such acutely painful diseases of the hind feet, to relieve the animal of its weight by slinging. "Knuckling over" at the hind fetlocks—a common evidence of lameness or "wear"—may be best observed in the stable before the horse has been "warmed up" by exercise, as may also be the "carrying" or continuous holding up off the ground of the limb in cases of acute pain in the foot.

Some horses manifest lameness when "put over" in the stall. This may be the only objective sign in some occult cases of bone spavin, in which on sudden movement the weight is more quickly shifted on to the sound limb; and in such cases this sign may be corroborated by keeping the hock fully flexed for a minute or two when acute pain will be evinced on straightening. Shivering and stringhalt may also be detected by suddenly moving the horse from side to side in the stall. Any undue wear of the shoes at the toe or heel resulting from lame action; any special method of shoeing for corns and sand crack and the like, and for the avoidance of clicking, over-reaching, brushing, and speedy-cutting; as also objective signs of these, may be best observed when the animal is at rest.

Examination when in Motion.

Close observation of the animal when he is being brought out of the stable is very necessary; for, in the incipient stages of such diseases as bone spavin and navicular disease, the slight lameness exhibited on first moving may quickly disappear. On the other hand, when lame from corns, and from splints in some positions, the horse comes out of the stable apparently sound but shows lameness after going for a time, and of course the observation of this sequence of events is of material assistance in "spotting" the seat of lameness.

Many horses in quite a number of lamenesses, and most horses in some forms of lameness, may go quite sound in the walk. For the detection of the lame limb, when in motion, an easy jog-trot is the best gait.

The horse should be *led* in a halter or snaffle bridle at a pace the slower the better, so long as it is a trot, and with the halter or rein held loosely, so that the free movement of the head and neck may not be interfered with and that it may not be inclined or pulled to one side, in which case, as previously pointed out, a confusing "bridle lameness" may be apparent. A short, tight hold of the rein or the use of a curb bit enables the groom, if so inclined, to make the horse toss his head and prevent him from exhibiting that "nodding" of the head which is so helpful in locating the lame limb. Like disadvantages attend the *riding* of a horse at a canter, amble, or jerky trot, or continuously on the prance and dance, and such like "tricks of trade"; besides, the rider or groom may, by exciting the animal, niggling at the bit or "catching him by the head," cause a lame horse to go comparatively sound for a time.

Examination for detection of lameness during movement should be made on hard ground with a smooth, even surface, level or with a slight incline. A macadamized road is admirable. In cases of doubt, a change to soft ground is advantageous, in that, a marked amendment of a gait previously considered suspicious is eloquent; sometimes also the lighter impress of the lame foot on soft ground can be distinctly observed.

Sometimes lameness is only developed on resting after smart exercise, and at Irish horse fairs it is the invariable custom to give the animal a smart gallop or other severe work, and then allow him to rest quiet an hour or so before commencing an examination for lameness.

To ascertain which is the lame limb, the horse should be taken at an easy jog-trot to and from the person inspecting it for a distance of 30 yards or so, and any halting or faulty steps when being turned should be looked for. If the lameness be in one fore limb, the motion of the head should be observed as the horse is approaching, when it will be found to "nod," its descent accompanying the sound limb as the foot strikes the ground. This dropping of the head is especially noticeable in splint and elbow lameness. If lame in one of the hind limbs, the motion of the croup and quarters should be watched, as there is a dropping of the sound quarter, while the lame one appears to be raised. In lameness of the hind parts there is less dropping of the head. In short, *a lame animal always comes to the ground with more weight on the sound limb than the lame one*, and tries to avoid much motion of the part affected on account of the pain consequent on movement. For the same reason, the step of the sound limb is shorter, the animal getting it to the ground as quickly as possible, in order that he may be enabled to raise the lame limb without delay and so get relief from the pain of sustaining weight. In other words, he "dwells" perceptibly on the sound limb.

When lame in both fore limbs the animal may *seem* to go as if sound, for he has level action. Various devices to deceive are based on this. If a horse is lame on one foot, it is a not uncommon practice among unscrupulous dealers to pare the other foot close to the quick so as to make both equally tender in action—"beaning" it is called; but careful observation will detect a stiffness or want of freedom, shortness of action or "grogginess," a rolling motion of the body, or other suspicious feature. A horse lame in both fore is apt to pick his hind legs up quickly, giving the impression of jerky action, simulating that of stringhalt. In spavin and in cracked heels and sand-crack behind there is also a "clicking up" of the limb, which might be mistaken for stringhalt, but which may be distinguished from it by the fact that the limb is put down again slowly, which is not the case in stringhalt.

It is somewhat confusing to apparently find a horse going lame on one limb when coming to you, and on the other when going from you, but in such cases it is pretty certain he is lame on both.

What is known as "cross lameness" is also confusing. By this is meant an apparent lameness in a fore limb, accompanying an actual lameness in a hind limb, and accounted for by the fact that when lame in a hind limb more weight is thrown on the diagonal fore limb, with the consequent suggestion of lameness in the fore limb of the *same* side as that on which there is actual lameness behind.

The next step in the examination for lameness should be the sudden turning or twisting round of the animal to the "right about" and the "left about" in as short a space as possible. This is best done by the examiner himself, who will, while so engaged, be able to detect any "faulting" in either of the fore or hind limbs and any dropping of the loins and quarters. Sometimes a horse that has gone apparently sound in the straight trot will be found so lame on being smartly swung round as to hop round on one leg—the sound one, "carrying," or never touching the ground with the lame one. The horse should next be smartly backed to discover signs of stringhalt and shivering. In the latter affection, if the indications so afforded are so slight as to be non-committal, backing the horse from the edge of a shallow pool into the water will render them sufficiently pronounced to enable a conclusion to be definitely come to.

It must be remembered always in examining for lameness that when there is an obvious unsoundness it does not always follow that the lameness is produced thereby. Oftentimes a horse lame behind may have a spavin so clear and distinct that a groom might say "he could hang his hat on it," and still the lameness be due to some other cause—a pricked foot, a fracture of the navicular bone (or even of the pelvic bones), or some other obscure cause.

In practice it is always advisable to eliminate lameness in the foot first of all; and, to be completely on the safe side, in *all* cases of lameness the shoe should be removed and the foot examined. This was the never-ceasing advice of the ever-famous Professor Dick, of Edinburgh—a man who was reputed to be so gifted and so expert in detecting lameness as to be able, when lying in bed in an upstairs room, to correctly decide by sound alone the limb on which a horse passing along the neighbouring street was lame, and sometimes under the same circumstances to be able to conclude as to the seat of the lameness. And that to follow the advice is sound practice, even when the cause of lameness is abundantly obvious, is demonstrated by the classical illustration—also Dick's—of a horse with a broken leg being found, on removal of the shoe, to have a festering wound in the foot, caused by a gathered rusty nail; in which case the barren honour of diagnosis of a broken leg was glorified by the discovery of the cause of the stumbling which doubtless led to the fall and fracture.

DIAGNOSIS OF OBSCURE LAMENESS.

It is not an unusual thing to meet with cases of lameness in which the diagnosis is a matter of extreme difficulty. The limb may present no abnormality, there is no apparent increase or decrease of heat or sensitiveness in any part, and no resting or easing attitude of the limb. Furthermore, when the lameness is only slight, the character of the "action"

during movement is not sufficiently pronounced to assist definitely to a diagnosis. In such cases, diagnosis can be confirmed or otherwise by the hypodermic injection of a local anæsthetic over the course of the nerve supplying the part suspected of being the seat of lameness.

The operation is simple, and no bad results should follow, or swelling remain, if ordinary antiseptic precautions are taken. Considering the assurance which such a plan gives against the inevitable mistakes of guess-work in diagnosing obscure lameness, it is surprising that it is not more often adopted. Of course, a correct knowledge of anatomy—the situation and course of the nerve to be injected—is fundamentally essential to the success of the method: without this the result may be oftentimes misleading and disconcerting.

The composition of the anæsthetic injection may be varied, according to the experience of the operator, but a mixture of cocaine and morphia solutions is used with success. Twenty minims (drops), each of 1 in 10 solution of hydrochlorate of cocaine and hydrochlorate of morphine, mixed in 30 minims of sterilized water, would constitute such an injection.

The injection should be made over the course of the nerve immediately above the part suspected of being diseased. For instance, if the foot is suspected, an injection is made on each side of the pastern over the course of the internal and external digital nerves; if the fetlock, the seat of injection should be at the lower third of the metacarpal region (cannon bones), over the inner and outer metacarpal nerves, or opposite the transverse anastomotic branch joining the two nerves at the back; if the knee or splint bones, then inject at the bifurcation of the median nerve to form the two metacarpals on the inner side of the forearm above the knee, and also at the upper part of the bend of the knee, behind where the cubital nerve bifurcates; and similarly in corresponding situations when the hind limb is concerned. It is necessary to inject on both the inner and outer aspects of the limb in all cases, because cocaine acts only on the direct fibres with which it comes in contact. It has no action on those nerve filaments ramifying in the part which are recurrent branches of the opposite nerve, and which therefore still retain the power to transmit painful impulses. If both sides are injected, however, both the direct and recurrent fibres of each side are prevented from transmitting sensation.

Complete anæsthesia of the nerve and part should result within half an-hour at the outside, but it often comes on within five or ten minutes; and this may be tested by pricking the parts below with a pin or pen-knife, when no sensation will be felt. If the suspicion as to the seat of lameness has been correct, the animal should then be free from lameness. If, however, lameness is still shown, and the injection has been properly made, it may be safely assumed that the speculation as to the seat of lameness was wrong, and the operation should be repeated next day in another suspected situation. The effects of the injection will pass off in a couple of hours, and by that time sensation will have become re-established, and the lameness will have returned and be as pronounced as ever.

SHOULDER LAMENESS.

It is an impression commonly held by "the man in the street," or the horsey variety of that ilk, that lameness in the shoulder is of common

occurrence. Such an impression is entirely erroneous, for, in point of fact, lameness in this region is comparatively rare. The impression has arisen on account of the tendency to ascribe all obscure forms of lameness to some occult condition of the shoulder, and veterinarians cannot be altogether held blameless for this commonly held, but mistaken, belief. It has been, and perhaps is, too much the fashion, when non-plussed as to the seat of lameness to, tentatively at all events, blame the shoulder; and having put it (the lameness) on to the shoulder, the putting of something else on, in the shape of a blister, is forthwith proceeded with. While it might be perhaps unfair to say that the object of such procedure is to gain time, there is no doubt that the most salutary effect of blistering in

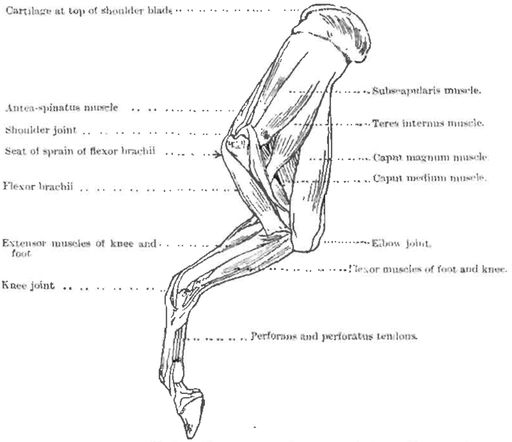


Fig. 1.—Dissection of Fore limb—internal aspect.—(After Chauveau.)

such cases is to allow of lapse of time during which one of two things frequently happens. Either during the enforced rest which a blister usually necessitates, the lameness disappears—the injury causing it having been naturally repaired; or, certain positive symptoms become developed, whereby a correct estimate of the seat and cause of the lameness may be made. It is certain that the number of blistered shoulders (and loins, hips, and stifles, too, for that matter) that may be met with in a hospital paddock is out of all proportion to the number of cases in which shoulder trouble is the actual cause of lameness; and it is amusing or annoying, according as you are the owner or (as the lawyers have it) the "person in charge" of the case, to, later on, find your horse that is blister-bald at the point of the shoulder oozing matter from the coronet as the result of the three-weeks-gone prick in shoeing that had hitherto not obtruded any definite sign of its existence.

When a horse *is* lame in the shoulder, it is usually a one-side lameness only, and is a result of one of three conditions, which are:—

(I.) Shoulder Slip.

(II.) Sprain of the Flexor Brachii or Biceps Muscle.

(III.) Injury to the Shoulder Joint.

Shoulder Slip.

The term "shoulder-slip" is apt to convey the impression of a dislocation or partial dislocation (luxation) of the joint formed by the blade bone (*scapula*) and arm bone (*humerus*). In so far as it does convey any idea of that kind, it is misleading; dislocation of the shoulder joint being a matter of very rare occurrence indeed. The term rather refers to an outward slipping or oscillating movement of the shoulder joint at each step when the weight is thrown on the affected limb. Why this slipping movement occurs will perhaps be understood when it is explained that the particular affection known as shoulder-slip occurs as a result of a sprain of the muscles (the *antea-* and *postea-spinati* muscles) covering the shoulder blade and passing over the shoulder joint to be inserted to the upper end of the arm bone below the joint. These muscles act as binding ligaments of the joint, and when they are sprained and therefore comparatively powerless to firmly hold together the bones forming the joint, the latter is apt to slip and oscillate uncontrolled during movement.

Causes.—Shoulder-slip, or more correctly shoulder sprain, is most frequently caused by over-strain or jerking during pulling. It is most common in young farm horses being broken in to plough, which, by their awkwardness and the unevenness of their footing, are likely to pull jerkily. Wrenching of the muscles may also occur on sudden and unexpected turning, or by slipping when turning on uneven ground, or when cantering over crab-holey country.

Symptoms.—It must be borne in mind that the action of the muscles which are strained is to draw forward the arm, and so assist in advancing the limb, and consequently, as a result of their powerlessness, the most marked symptom during movement is a dragging of the limb, which is swung outwards as it is brought forward. A "tied-up" action of the shoulder joint, in the evident attempt to avoid much motion; and the oscillating motion previously spoken of and explained, are also noticeable. There is but slight dropping of the head, as there is little pain when the limb is brought to the ground. It is during action that the pain mostly exists, and that the inability is most evident. When at rest the limb hangs loosely, with the joints below the shoulder partly flexed, so as to relieve the tension on the sprained muscles, and the foot rests on the toe, and is placed a little behind its fellow. The sprain, which is at first shown by local pain, heat, and perhaps swelling, is quickly followed by a wasting of the muscles involved, which makes the spine of the scapula stand out prominently, and gives the shoulder a shrunken or wasted appearance when compared with its fellow. This shrunkenness and the accompanying absence of bi-lateral symmetry is well seen by standing straight in front and comparing the two shoulders. Lifting the limb and forcibly flexing the shoulder and elbow joints, by putting strain on the injured muscles, causes pain, evidenced by flinching.

Summarized, the main symptoms are:—

(*a*) Dragging the toe and bringing the limb forward with an outward swing so as to describe an arc, thus ⌒, and trying to avoid much motion of the joint.

(*b*) A kind of outward slipping or oscillating movement of the shoulder joint at each step, when the weight is thrown on the affected limb.

(*c*) When standing, if the lameness is severe, the knee and fetlock joints are partly bent, head elevated, and toe resting on the ground—no pointing.

(*d*) In some instances, actual lameness does not occur until the affected muscles have become wasted or shrunk, when there will be a hollow space on each side of the scapula or blade bone.

(*e*) Pain, heat, and perhaps swelling in the sprained muscles, and tenderness evinced on the application of pressure.

(*f*) Flinching on extreme flexion of the shoulder and elbow joints.

Treatment.—In the early stages, hot fomentations, continued for about an hour, if the injury is obvious by local pain, heat and swelling, should be applied two or three times a day, after which "white lotion" or other cooling application should be sopped on. Complete rest should be enjoined, and a high-heeled shoe should be put on to relieve muscular tension. The food should be soft and non-heating, and the bowels should be kept open by giving 2-oz. doses of Epsom salts in the drinking water twice daily. Later on, when the heat and other local symptoms have disappeared, the parts may be blistered with a fly blister (*vide* page 75). The blistering may require to be repeated two or three times. A lengthened spell at grass (three to six months) is advisable, because, after the lameness has disappeared, the muscles are still weak and liable to a recurrence of sprain if the horse is put to work too soon.

Sometimes the wasted condition of the muscles referred to above remains permanent, in which case there is always more or less inability, evidenced by a dragging or swinging action, and the horse qualifies for the appellation of "three legs and a swinger." This permanent shrunkenness occurs when the muscular fibres have become completely destroyed or diminished in *number* by wasting (numerical atrophy). If the shrinkage has only been in *size* of the fibres, and none have been destroyed (simple atrophy), then complete restoration of power may be expected.

Sprain of the Flexor Brachii or Biceps Muscle.

This muscle is situated in front of the arm bone (*humerus*), running down from the point of the shoulder blade to the upper end of the bone of the fore arm in front of the elbow, and its main action is to assist prominently in bringing the upper part of the limb forward. The seat of the sprain is usually in the sinewy or tendinous part of the muscle, at its upper end, near the front of the shoulder joint, where it passes over the groove in the head of the humerus, and where also it is liable to bruising and other injury from external violence, such as may be sustained by bumping against trees when galloping through the bush, or against a fence-rail or wall when jumping, or in a collision or other accident.

CAUSES similar to those giving rise to shoulder-slip may also result in sprain of this muscle. Rheumatic localization, as a cause of lameness in this region, is not uncommon.

SYMPTOMS.—These are generally the same as those of shoulder-slip, except (*b*) and (*d*), but they are likely to be more acute. The dragging action is more marked, the local signs of pain, heat, and swelling are more intense, the part is tender to the touch and greater pain and more pronounced flinching are exhibited when the elbow and shoulder joints are forcibly flexed. Wasting of the muscle does not usually occur, and except there is the formation of a bony deposit in the substance of the muscle permanent lameness or disability is very rare.

TREATMENT should be on the same lines as that recommended for shoulder-slip; and, although the condition is at first apparently more severe, better results follow the treatment more quickly.

Shoulder Joint Injury.

The shoulder joint is formed by the head of the arm bone (*humerus*) fitting into the shallow cup-like cavity at the lower end of the blade bone (*scapula*). It is seldom dislocated, but is liable, partly on account of its prominence, to injuries sustained in the manner above described. The edges of the joint bones may become bruised or inflamed or actually chipped off, and the articular cartilage and capsular ligament of the joint may also be injured. Rheumatic affections may become localized in the joint, especially after injury in the case of old horses.

SYMPTOMS.—Apart from pain and local swelling, which latter, in the case of ulceration of the articular cartilage or thickening of the capsular ligament, depends upon distension of the joint with joint oil (synovia), and is very difficult to remove, the symptoms are principally those of stiffness and pain in the joint—*i.e.*, absence of much movement. The dragging action is exhibited; in this case not so much on account of muscular inability to bring the limb forward as that the movement in the joint accompanying advancement causes pain.

TREATMENT.—That recommended for the two previously described conditions may also be followed in this case. It involves first of all the reduction of the inflammation by fomentations and rest, to be followed by repeated blisterings to assist in completing the process of repair and in the removal by absorption of any excess of joint oil or other swelling.

(Shoulder lameness may also occasionally arise from sprain of the chest muscles (*pectorales*), or from fracture of the first rib.)

(*To be continued.*)

GARDEN NOTES.

J. Cronin, Inspector, Vegetation Diseases Acts.

The Petunia.

Petunia is a genus of dwarf perennial plants found native in South America. The present garden forms are assumed to be hybrids from *P. nyctaginaflora*, introduced into European gardens in 1823, and *P. violacea*, introduced in 1831. Originally the petunia produced single flowers only, and it is due to the skill and care of the hybridist that the present popular double forms were evolved. The habit of growth was also improved by careful crossing and selection, and the hybrid varieties were soon cultivated to the exclusion of the original species, their flowers being more varied in form and colour, and of larger size and greater substance.

Some years back the petunia was a popular plant in Victorian gardens, and very fine varieties were raised, named, and distributed by some of the nurserymen of that time. Fine specimen plants grown in pots were often seen at the horticultural shows, and the plants were largely used also for bedding. Their popularity has decreased largely, but lately they are again coming into favour, the introduction of new, large, brightly-coloured strains being mainly responsible. The petunia is one of our best, hardiest, and most easily grown border plants. The plants endure heat and drought well, and continue to produce their attractive blossoms for a long period during summer. The single-flowered varieties are most suitable for border decoration, or for massing in schemes of colour. They are not suitable for cultivating in places specially liable to dust, or where the atmosphere is heavily charged with grime or smoke, their viscid leaves becoming coated with such substances, which are difficult to eradicate, and which check the vigour and bloom of the plants.

Propagation—Culture.

Petunias are usually treated as annuals, except in the case of specially fine varieties. The plants are raised from seed annually, and when their blooming season is over are thrown away, and a new stock raised from seed for the ensuing season. Most of the double kinds are propagated from cuttings, though there are strains of seed that will produce about 25 per cent. of double varieties. The seeds may be sown in autumn or spring. Autumn sowing is preferable, except where severe frosts occur in spring. The plants are strong, and will bloom early and continuously if well cultivated. The seed is very small, and should be sown in light soil in well-drained pots or boxes. The soil should be rather moist, and the surface firmly pressed and even before sowing the seeds. A very light covering of soil should be applied, and the whole watered very gently and lightly to prevent the seed being washed together in heaps, after which the pots or boxes should be transferred to a close frame, or a sheet of glass should be placed closely over them till the seeds germinate. This covering should be removed gradually as the plants grow, being finally removed when they are ¼ inch in height. The plants should then be potted into single pots, or transplanted into other boxes of light soil, and grown on till spring, when they should be planted out. When the seeds are raised in spring they may be allowed to remain in the seed-box until ready to plant out where it is intended they should bloom.

Cuttings of the young shoots that develop laterally along the stems, or at the base of the plants, root readily in a cold frame, or under a bell-glass or a closely covered box, if inserted in sandy soil during April. The cuttings should be about 3 inches in length, the leaves trimmed from the lower half of the cutting, and the cuttings inserted around the edge of the pots of sand. The pots should be well drained, and the sand washed, to remove any fermenting medium. A box (like a butter-box) should be filled to within 6 inches of the top with light soil, sand, or ashes. Holes should be bored in the bottom to permit of drainage. The cuttings may be inserted, say, six in a 5-inch pot, always inserting cuttings around the edge, in preference to the centre of the pots. Four such pots will be accommodated in a butter-box, and after the cuttings are inserted should be plunged to the rims in the material in the box, lightly watered, and covered closely with a nicely fitting sheet of glass. In such a frame a number of cuttings may be rooted during the season. After the cuttings are rooted, they

SINGLE PETUNIA—"GIANTS OF CALIFORNIA."

DOUBLE FLOWERING PETUNIA.

should be potted into small pots and grown on till spring, when they may be either planted out in the border or re-potted and grown on in larger pots. Petunias succeed well in pots, and nice bushy plants may be developed by occasionally pinching the leading shoots. The soil for pot culture should be light and porous, and the pots should be thoroughly drained.

The most suitable soil for growing petunias in the open border is a moderately rich light loam, but the plants will thrive fairly in any fair garden soil. Excessive manuring will produce large plants without a corresponding increase in the number or quality of the flowers. A fairly open position should be allotted them, and ordinary border cultivation, including watering during dry hot weather, will suffice to bring the plants into a condition that will enable them to produce an abundant crop of flowers.

Varieties.

Most of the nurserymen have ceased to catalogue petunias under name, though they have named varieties in stock. A proportion of double flowering kinds may be expected from some of the special strains of seeds, of which Hender and Sons' double-fringed is one of the most reliable. "Giants of California" is a noted large-flowering single strain, although many gardeners prefer the smaller fringed varieties, especially for bedding purposes.

Flower Garden.

With fairly moist weather conditions, April is generally a suitable month for planting out plants grown in pots, divisions of herbaceous plants that have finished blooming, and layers and cuttings propagated during summer. Carnations will thrive better if planted out now than at any other period. The soil being warm and moist, the young plants soon become established, and bloom freely in spring. If it is desired to produce specially fine blooms, the plants should be set out in specially prepared beds, and strong young plants, either spring struck cuttings or layers rooted during summer, selected. The beds should not be over-shaded, but protected from hot north winds. Narrow beds that will accommodate two or three rows of plants are most suitable, the plants being set out 2 feet apart each way. Cuttings of tree carnations will root readily in the open ground if inserted in sandy soil this month. Should the weather be dry, select end of the month for preference. One of the largest growers in the State produces practically all his plants of tree carnations from cuttings planted in narrow borders near his boundary fences. The soil for the purpose should be sandy and unmanured. Where the natural staple is heavy and retentive, a little sand placed at the base of the cutting will facilitate propagation. The cuttings are best set out in rows, about 1½ feet between the rows, 3 inches between each cutting. Short lateral shoots about 3 or 4 inches in length are usually developed along the shoots of the plants. These will root readily, and will make nice sturdy plants. The only preparation necessary is to trim off the leaves for about half the length of the cutting, insert it to that depth in the soil, firmly press the soil around it, and water after insertion. Should the weather prove dry after planting the cuttings, they will need to be watered occasionally.

Autumn planting of hardy plants that will resist frost, whether raised from seeds, divisions, or cuttings, is to be specially recommended where a supply of water is limited. Such planting enables the gardener to have well-grown plants early in summer, which, by good surface culture of prepared beds, may be expected to bloom satisfactorily. A number of spring-blooming bulbous plants may be planted. In every case no animal manure should be allowed to come into contact with bulbs or corms. Manure may be worked deeply into the soil, but the base of the bulb should rest on sweet soil only.

Ground should be prepared for the planting of deciduous trees, plants, and shrubs. Drainage should be a primary consideration. Half-rotted manure should be well mixed through the soil where it is intended to set out permanent plants.

Seeds of hardy annuals may be sown for transplanting, and seedlings raised previously planted out.

Kitchen Garden.

Ground should be prepared for the reception of various vegetables for spring use. In low, moist situations, narrow beds, well ridged, are

preferable to those wider and flatter. A greater surface is exposed to the influence of the sun and wind, and the roots are working in a more aerated soil.

Onion seed may be sown for transplanting. The seed should be sown thinly, and pressed firmly before covering. Seed may also be sown to use green in spring. Cabbage and cauliflower plants may be set out, and seeds of early varieties sown. The cabbage requires a well enriched soil, stable manure being considered by market gardeners the best manure for the purpose. The ground should be deeply worked, and the manure mixed well through.

A sowing of early peas should be made. Provision for staking the plants is considered necessary by most market gardeners, especially during winter. Ground should be prepared for successive sowings. Moderate manuring is preferable to heavy for the winter, the latter producing a superabundance of haulm.

Divisions of various garden herbs may be planted out. Seeds may be sown of annual herbs that will stand frost, and of various salading plants that may be required.

TREE PLANTING AND FOREST PRESERVATION.

Alfred J. Ewart, D.Sc., Ph.D., F.L.S., Government Botanist and Professor of Botany in the University of Melbourne.

In Mr. Reed's admirable article on this subject in the December number of the *Journal of Agriculture*, due stress is laid upon the importance of this question as a factor in the agricultural future of Victoria, and a list of the advantages to be derived from systematic tree planting and preservation is given. In addition to these advantages, however, two others are worthy of mention, especially as they rarely have their proper importance attached to them. They are the influence of trees in maintaining the fertility of the soil, and their anti-spasmodic action on rainfall.

THE INFLUENCE OF TREES IN MAINTAINING THE FERTILITY OF THE SOIL.

This action is three-fold in character. The deeply penetrating roots which most trees form over a part at least of their root-system draw up water from the deeper layers of the soil, to which the roots of ordinary crops do not penetrate. This water contains all the mineral constituents of the plant's food in varying proportions, and these salts are very largely stored up in the leaves and bark as waste products after they have been utilized. In this way they ultimately reach the surface of the ground again, while the leaves, bark, and fallen dejecta of the tree slowly rot and add to the percentage of humus in the soil, so increasing its capacity for holding water.

Ordinary crops have comparatively shallow root-systems as compared with most trees. Thus the roots of barley and mustard usually penetrate to a depth of 1 yard, while those of the perennial clover and wheat may extend to 2 yards below the surface, and those of the everlasting pea

and lucerne may reach a depth of 3 yards. The roots of old, well-established deeply-rooting trees, on the other hand, may penetrate to a depth of 20 yards or more, although the greater part of the root-system will be at a considerably less depth. In addition, the root can draw water laterally or upwards from neighbouring moister regions of soil, and the finer the soil the greater the distance over which this action may extend.

In the case of soils with a friable, open surface, the whole of the rain drains into the soil, unless the rainfall is extremely heavy. Each shower of rain washes downwards a part of the soluble constituents of the soil held by surface absorption on the soil particles. These soluble materials, for the most part, are washed past the crop root-system, and join the ground water in the deeper layers of the soil, which, in the absence of trees, drains away to the rivers or to the subterranean water-systems. These, for the most part, pour into the sea the calcium, potassium, and magnesium nitrates, sulphates, and even traces of phosphates leached from the soil, together with various other mineral constituents not required for plant food.

The roots of trees catch these mineral constituents to a large extent, suck them in along with the water they absorb, and pass them up to the leaves. It is worthy of note that it is mainly the useful soluble salts which are absorbed with the water, whereas as soon as the plant is clogged with the useless salts further absorption of these is checked. In other words, the tree selects to a certain extent the salts it requires, and sends them up to its leaves, and these salts are precisely those which crops require. During its whole life the leaf of a tree contains a nearly constant amount of potassium, magnesium, nitrogen and phosphorus, while the calcium usually steadily increases. Although the percentage of the first four elements usually decreases somewhat before the leaf falls, which takes place ultimately whether the plant is deciduous or an evergreen, a relatively large amount remains in the ash of the fallen leaf. As these salts are set free by the decomposition of the leaf and other dejecta membra of the tree in the soil, the ash constituents partly reach superficial root-systems, partly deep root-systems, and partly are washed out of the soil. The amount of mineral manure circulated in this way by a tree during its average life-time is considerably greater than that retained by the tree in its wood, which in most cases contains a very low percentage of nutrient mineral substances if calcium is excluded.

It follows, therefore, that belts and clumps of timber on a farm help the farmer to retain on his own land the manure he puts into it, and so reduce the annual loss by drainage of the soluble constituents of the manures applied to the crops. As Mr. Lee has shown in the December number of this *Journal*, the crops are usually only able to catch and absorb a small fraction of the essential elements supplied to them in the form of manure.

Belts of timber on the banks of streams are of the utmost importance, not merely in preventing the erosion of the banks, but also because their roots form a filter through which the drainage water from the soil must pass, and be in part deprived of its mineral matter. At the same time, the effect is to hold up the ground water on each side, and prevent over rapid and erosive drainage from the soil.

The branches and leaves of most trees contain from one to four parts of ash per 100 of dry weight, whereas the dry wood usually contain less

than 1 per cent. of ash. Some idea of the relative proportions of the valuable ash constituents can be obtained from the following comparative values per 100 parts of ash:—

	Wheat Straw.	Leaves.	Wheat Grain.	Potatoes.
Potash	10	20	30	28
Lime	6	12	3	2
Magnesia	1	6	11	4
Sulphuric acid	2	4	$\frac{1}{3}$	5
Phosphoric acid	5	9	48	10

The nitrogen practically does not appear in the ash, but in ordinary decomposition in the soil it is slowly set free as nitric acid, which combines with the bases in the soil to form soluble nitrates.

The value of Trees as humus-producers can hardly be over-exaggerated, for the benefits conferred upon soil by the presence of humus in it are many and various. It increases the water-holding capacity of the soil. Thus a soil containing a fair quantity of humus will hold from two to three times as much water available for the plant's use as a pure sand. The presence of humus, and in this respect the humus formed from the decaying leaves of trees is especially valuable, increases the chemical actions in the soil, and causes more of the insoluble constituents of the soil to be rendered soluble and available for mineral plant food. In addition to this, the humus itself has a special power of retaining these soluble constituents in such a manner that the loss by washing from the soil by rain is reduced to a minimum, while at the same time they can still be absorbed by the roots of the plant, and handed over as they are required. Finally, humus lightens heavy soils, and favours their aeration.

A simple experiment to show the beneficial action of humus upon the roots of plants is to place on a heavy soil or clay surface a layer of leaf mould or well-rotted manure an inch or two thick, and cover this with 3 or 4 inches of clay or clayey soil. Soaked seeds planted on the surface soon strike downwards, and if the plants are dug up and examined by the time the stems are half-a-foot to a foot high, it will be found that the greater part of the root-system has been developed in the layer of humus. This is especially well shown by the garden "Nasturtium," but also by cereals and other agricultural plants, although, when the plants are older the roots are forced to strike deeper in search of water.

In warm climates the decomposition of humus in the soil is rapid, and hence there is little danger in this State of any excessive accumulation of humus leading to souring of the soil. The latter can, in fact, always be overcome by drainage and liming, and such soils, when properly handled, often prove to be of great fertility. Forest fires, by burning the humus off the soil, do incalculable damage, which, under primitive ancestral conditions, appears to have been made good in the following way:—After a severe bush fire had burnt off the humus and left the naked inorganic soil more or less fully exposed, seeds of *Acacia* and other plants lying dormant in the soil, and thus brought near to the surface, germinated. Acacias and other leguminous plants, by the aid of their root-tubercles, are able to obtain nitrogen from the air, and so develop readily in inorganic soils in which humus is deficient or absent. It is only in humus or organic soils that supplies of nitrates are continually being formed, any slight production of nitrates in, or addition of nitrates to, an inorganic

soil being soon washed out by the rain. The acacias and similar plants gradually add humus to the soil and enrich it, so that the original forest of *Eucalyptus* or other trees may slowly re-establish itself. Bush fires are not modern things, but were certainly frequent before the advent of civilized man in Australia, and were probably frequent before the appearance of aboriginal mankind. There can be little doubt that this cycle, taking a hundred or more years to complete, has been repeated countless times over widespread areas. In fact, we are probably correct in regarding the thick, fibrous, difficultly-inflammable bark developed on the bases of the main trunks of many of the larger *Eucalypti*, as well as the absence of branches for a considerable height above ground, as being, in part at least, adaptations by the plant to constantly-recurring plutonic conditions, and these adaptations enable such trees to survive the effects of the bush fire which roars its way beneath.

The danger of devastating forest fires is naturally greatest where a continuous area of forest exists, whereas, with belts and clumps of timber this danger is more localized, and the agricultural value of the tree-planting better fulfilled, especially if the borders and fringes of the plantation contain such plants as acacias or the tree lucerne, *Medicago arborea*, *i.e.*, nitrogen-fixing plants of economic value.

THE INFLUENCE OF FORESTS ON RAINFALL.

A full account of the evidence on this point is given by Mr. Maiden in the September number of the *Agricultural Gazette of New South Wales*, the general conclusion of the meteorologists being that forests do not increase the general average rainfall, but do affect local rainfall. It must be remembered, however, that the rain-gauge, on which the meteorologist pins his faith, is a very crude instrument, and that it is utterly impossible to measure the rainfall accurately in a forest by means of it, wherever the rain-gauge may be placed. In fact, many of the comparative observations are about as valuable as it would be to attempt to detect a leak in the roof by placing a rain-gauge in the garden.

In any case it is not a question of the total rainfall, but of what becomes of the rain. If the rain runs off the surface, ten times the rainfall will not keep the ground as moist and fertile as when it soaks in. An excessive rainfall is as bad as a deficient one, and renders a climate equally unfitted for agriculture, as witness the west coasts of Tasmania, Ireland, and Scotland, where humus forming conditions prevail to excess. A dry climate can be improved by irrigation, but an excessively wet one cannot be appreciably ameliorated.

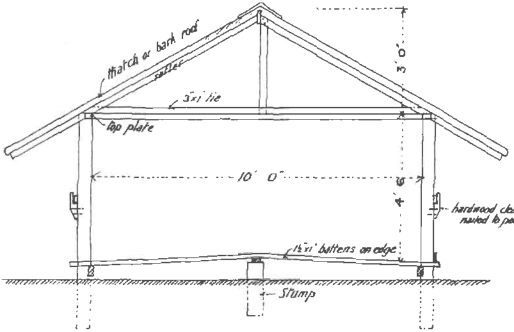
In an ordinary climate trees bring back the moisture and dissolved minerals from the deeper layers of the soil, and retain them largely in local circulation. The effects of the rain and the rain itself are made to last over a longer period, and the moisture conditions of the district made more equable, instead of torrential leaching and erosive rain, alternating with devastating droughts. A forest is a sponge, to suck up moisture when it rains, and give it out again slowly when dry, and in the term "forest" all permanently-wooded bush or scrub land is to be included.

This brief statement by no means exhausts the subject, but the evidence to show, for instance, how the methods of deforesting adopted in clearing the land for agriculture, and still more for sheep pasturage have favoured the spread of injurious weeds, is reserved for a subsequent paper.

SEED POTATO HOUSE.

George Seymour, Potato Expert.

In an article on "The Care and Preparation of Seed Potatoes," which appeared in the *Journal* for November, 1905, it was stated that the best way to keep potatoes intended for seed was, in the absence of cool storage, to spread them out on a piece of firm dry ground under the shelter of pine or other evergreen trees. As such a spot is not always available, the necessity for a suitable place prompts me to again refer to the matter and endeavour to furnish growers with a satisfactory solution of the difficulty. On most farms the tubers intended for seed are kept in pits. This may do very well for hardy sorts and late-maturing varieties, but it is decidedly

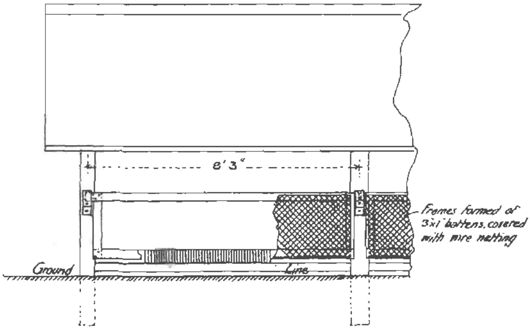


SECTION OF SEED POTATO HOUSE.

injurious to the early ones. I am satisfied more injury is done to the yield of the crops by the improper way in which seed tubers are kept than by any other single cause, and that more benefit will be derived from a proper method of keeping the seed than from a change of seed which has in many instances proved disappointing. I feel sure it would pay every grower to erect a structure, however rough, to keep his seed in. The result would be a more even crop, with stronger and more vigorous plants, which play an important part in the yield of a crop. The chief requirement is a cool dry place where the tubers can be exposed to the light as much as possible; the space should be sufficient to spread them out thinly, the thinner the better. The only thing to guard against is frost, and if this be avoided when they are first spread out, there will be little danger, as they will soon become green. Tubers kept in this way do not bud so quickly as when piled together in a heap, and, when the buds do start, the growth is very slow; the shoot will be strong, and of a green colour. If seed for early crops is kept in this way, allowed to sprout, and planted when the ground is warm, better results will be obtained than at present. The practice is to plant in the middle of winter, when the soil temperature is low, with

the result that the plant has to struggle against adverse conditions. For the potato plant to flourish, a temperature of over 60 degrees is required. In support of this I may mention a parcel of Early Rose and Carman No. 1 seed planted in my own field. The seed was dug early in April, spread out all the winter on the barn floor, cut mostly to a single eye, and planted on the 6th December. They were above ground in ten days, and before the 6th January many of the plants were in bloom. By the end of the first week in February, or under ten weeks after planting, there was a crop of tubers large enough to lift, but, of course, too green to handle.

It should be remembered that the fine texture and early varieties are liable to injury if stored in pits, especially so in districts where planting cannot start until the end of October or the beginning of November. By this time the days are lengthening, and the temperature is increasing



SIDE ELEVATION.

daily, causing the tubers to throw out their buds, and, as they are closely packed together, the air cannot circulate through the heap. The result is that the potatoes soon become a mass of sprouts, and long shoots force their way to the open air. Further, in this unventilated condition they heat, and soon begin to rot. Tubers kept in this way will, when cut, immediately turn black inside, and, if planted, are sure to rot, while whole tubers are very little better.

Instances have come under my notice this season where crops of early potatoes have failed or missed badly. Had the seed been kept under proper conditions, this would not have occurred.

The accompanying illustration of a shed for storing seed potatoes will give some idea of what is required. The posts are 4 ft. 6 ins. out of the ground, carrying a plate at the top to take the rafters. The material of the roof should be of thatch or bark, and should project at least 2 feet over the sides of the shed. The floor should be 6 inches off the ground at the outside, and slightly raised at the centre; it should be composed of $1\frac{1}{2}$-in. x 1-in. battens, laid on edge, and fastened to the joists, the battens being spaced at such distances as not to allow the small sets to

pass through. The tubers will require turning, and for this work a wooden fork should be made. The prongs of the fork should correspond with the spaces between the battens, so that in turning the tubers they will run in the spaces and not injure them. If poultry can get at the tubers it will be necessary to protect them with wire netting fixed to frames as shown in the sketch.

The shed may be constructed of any material available on the farm, and in addition to the floor shown in the illustration could be made to take one or more tiers of trays, thus providing a much larger space for storage under the same roof. Trays can be made from the cases in which galvanized iron is packed cut to a handy size, about 2 ft. by 2 ft. 6 in. If trays are used it will be necessary to put in uprights to carry them. The space to accommodate a ton of potatoes spread out to a depth of 5 inches is about 10 x 12 feet.

Seed tubers are in the best condition for planting just when the bud starts; this condition is hastened when the temperature of the atmosphere reaches in the day time to 60 degrees and over. Consequently tubers dug in the summer are usually ready to plant in from 5 to 7 weeks after digging, but the sprouting can be retarded for long periods by keeping the seed below 40 degrees.

In the cooler districts along the Dividing Range potatoes dug in April are usually ready to plant *in the same district* by September, but may be planted during July and August in the earlier districts near the coast.

THE PROCLAIMED PLANTS OF VICTORIA.

(*Continued from page 137.*)

Alfred J. Ewart, D.Sc., Ph.D., F.L.S., Government Botanist; and J. R. Tovey, Herbarium Assistant.

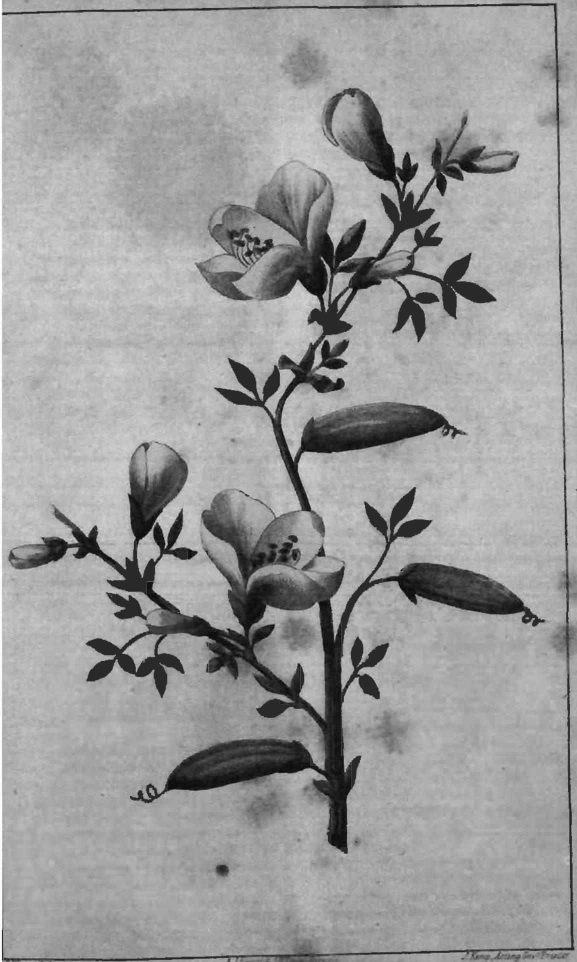
English Broom.

Cytisus scoparius, Link (Leguminosæ).

A shrub of 2 to 6 feet, nearly glabrous, but the younger branchlets and leaves silky, with numerous long, straight and erect, green, wiry branches prominently angled. Lower leaves shortly stalked, with three small, obovate leaflets; upper leaves sessile, or shortly stalked, the leaflets often reduced to a single one. Flowers large, bright yellow, solitary or in pairs, on slender pedicels, in the axils of the old leaves, forming handsome leafy racemes along the upper branches. Petals all broad, the standard broadly orbicular, the keel deflected. Pod $1\frac{1}{2}$ to 2 inches long, flat, brown, or black, hairy on the edges, but glabrous on the sides, the seeds attached to a line considerably within the edges of the pod.

A native of Europe, Northern Asia, the Canaries and Azores. This hardy, deciduous shrub is very difficult to suppress; it should be dug up before flowering, and the root-stock removed from the soil, or it will grow again. Mowing will prevent the seedlings from re-establishing themselves, but not grazing. Proclaimed for the Shire of Glenlyon, July, 1902.

PLATE II.



ENGLISH BROOM

(*Cytisus scoparius*, Link)

THE ELEMENTS OF ANIMAL PHYSIOLOGY.

W. A. Osborne, M.B., D.Sc., Professor of Physiology and Histology, Dean of the Faculty of Agriculture in the University of Melbourne.

(*Continued from page 89.*)

CHAPTER V.

The Proteins.

We have seen in the preceding chapter that complex polysaccharides, such as starch, are formed by the union of many units of a comparatively simple sugar, namely dextrose. But the proteins with which this paper deals are immensely more complex than any carbohydrate, for they are formed, not by the union of a number of units of a single substance, but by the union of many units of many substances. We have seen that a complex carbohydrate, when boiled with an acid, splits up into its component parts; the same occurs with a protein, and the chemist is able in this manner to determine what the constituent groups are. Now, the simple bodies into which proteins can be decomposed, and from which they can be built up by the plant or animal, all belong to the class of bodies called AMINO-ACIDS. These are soluble, crystalline substances, weakly acid in character, and containing nitrogen as well as carbon, hydrogen, and oxygen. It would be inadvisable here to give anything like a complete list of the amino-acids which can enter into the composition of proteins; the important ones only will be mentioned, and these are—

LEUCIN, which crystallizes in spherical lumps, and is gritty, like sand. It can often be seen as a sediment in pancreatic extracts.

GLYCOCOLL, which has a sweetish taste and is formed in quantity when gelatine is boiled with an acid.

TYROSIN, found in considerable amount in cheese, and hence its name (Greek, turos = cheese). This important amino-acid belongs to the same great class of chemical bodies as carbolic acid and benzoic acid, that is, the class of aromatic compounds.

TRYPTOPHANE, this body is the mother substance of nearly all the pigments of the animal body: in itself it possesses no colour, but when its structure is slightly modified it can yield substances of very rich tints—the colour of blood, bile, of urine, all being due to this body; even the green colouring matter in plants is a close ally. Moreover, it is largely to tryptophane that the evil smell of a putrid animal body is due, as also the smell of the fæces of carnivores, for tryptophane, under the action of bacteria, can pass readily into chemical bodies (indol, skatol, &c.), which have a penetrating and disgusting odour.

CYSTIN, this amino-acid contains not only carbon, hydrogen, oxygen, and nitrogen, but also sulphur, and it is to cystin that the sulphur content of protein is due. Cystin, when attacked by bacteria, gives off its sulphur as sulphuretted hydrogen, a poisonous gas which some people regard as having a most objectionable odour, and being reminiscent of rotten eggs.

HEXONE AMINO-ACIDS, these contain more nitrogen and have much weaker acidic properties than the amino-acids mentioned. They are present in all true proteins, and are obtained in considerable quantity from the soft roe of fishes.

This list, it must be remembered, is by no means complete, it omits many of the amino-acids (such as asparagin), but, as stated, it gives the important ones.

Now, if we imagine a large number of representatives of these amino-acids united to each other and forming an enormous molecule—a veritable tangle of amino-acid groups—we shall have something resembling a protein. The building up of a protein from its groups is performed rapidly and with ease by the animal or plant, but, so far, the chemist has not succeeded in performing this task in the laboratory.[1]

Proteins differ from each other, not only in the number of the groups present, but in the manner in which these components are arranged. There is practically an infinite variety of proteins possible, and we accordingly find a wide diversity between the proteins contained in living cells, of which they constitute the greater portion of the solid matter present.

Proteins in dry form are white and tasteless; a few can be prepared in crystalline form, for instance, the albumen of the white of egg, but only by very special treatment. Dry protein heated over a flame chars and gives off fumes that smell of burnt feathers; this smell, indeed, tells us that nitrogenous groups are present. The charring protein will readily take fire, and the char, which is chiefly carbon, will, if heated strongly enough, burn slowly away, leaving a very small residue of mineral ash. It is still a matter of debate how far these mineral salts enter into the composition of the protein; certainly no protein appears in the animal body that does not contain such salts, and the presence of the latter seems to be of vital importance; but, by suitable methods of washing, the amount of mineral matter may be reduced to a very small fraction of what was originally present.

A protein in solution tends to break up into a mixture of its amino-acid components. This is a very slow process, and can only be detected after the lapse of years, yet it is noticeable in tinned meats and preserved milk that have been stored a long time. This decomposition can be greatly accelerated, in fact, it can be completed in a few hours, by various means, one of which has been already stated, namely, boiling with an acid. A very interesting property of proteins, and one which has a very important practical as well as theoretical application is their inability to pass through a membrane composed of parchment paper or gelatine. If, for instance, we place white of egg in a bag made of parchment paper and dip this bag into pure water, the salts and sugars of the egg-white can diffuse into the water, but the protein remains behind as in a trap. If the water be renewed continuously, a time will come when nothing remains inside the bag but protein and water. This procedure is termed *dialysis*, and can be employed with a number of substances which, like protein, have large and highly complex molecules.

Proteins in solution can be thrown out as insoluble precipitates by means of various reagents. A number of these precipitations are frequently given as tests for proteins. Anything which precipitates protein destroys life if it gains access to the cell. The poisonous properties of corrosive sublimate, blue stone, sugar of lead, and most metallic salts are due to this fact, whilst a number of antiseptics owe their utility to their power of precipitating a part or all of the protein in bacteria.

1 It may be safely prophesied that this problem will shortly be solved by Dr. Emil Fischer, who appears to be within measurable reach of success.

Proteins can be precipitated by—

(*a*) Salts of heavy metals, for instance, mercuric chloride (corrosive sublimate), copper sulphate (blue stone), lead acetate (sugar of lead), iron chloride, &c.

(*b*) Strong mineral acids, notably nitric acid.

(*c*) Addition of ammonium sulphate to saturation point; the protein is here thrown out of solution in the same manner that soap is curdled by adding common salt to its solution.

(*d*) Certain reagents, like tannin or picric acid; the precipitation here produced depends upon the presence of the hexone amino-acids in the protein complex.

(*e*) Alcohol, which precipitates all proteins except a few occurring in the plant kingdom.

(*f*) To the above we might add the coagulation produced by boiling; the number of proteins thus precipitated is small, but the two chief animal proteins (albumens and globulins) possess this character.

In addition to these precipitation re-actions, proteins yield a number of colour tests when treated with certain re-agents—

(*a*) Due to the presence of tyrosin.—When protein is warmed with nitric acid, a yellow colour is produced; if the mixture is then cooled and ammonia added, an orange tint is developed. This reaction is frequently observed with young chemists who spill nitric acid over their fingers, a yellow stain is formed, which darkens with ammonia.

(*b*) Due to the presence of tryptophane.—If to a solution of protein a small quantity of strong acetic acid (which has been kept some time) is added, and then large excess of strong sulphuric acid, a splendid purple colour is produced.

(*c*) Due to the presence of cystin.—If protein, strong potash, and lead acetate be boiled together, the mixture darkens owing to the formation of sulphide of lead. The darkening of a silver egg-spoon is similarly due to the formation of silver sulphide, the sulphur being derived from the cystin of the albumen.

(d) Due to the manner in which the amino-acids are linked together.—If to protein solution some strong potash is added, and then a few drops of weak copper sulphate solution, a pretty violet-pink colour is produced; this colour can be readily distinguished from the bluish shade which would be formed if the protein were absent.

The percentage composition of dry protein deprived of mineral matter is generally given as follows:—

Carbon	...	...	50.6	—	54.5	per cent.
Hydrogen	...	...	6.5	—	7.3	per cent.
Nitrogen	...	...	15.0	—	17.6	per cent.
Sulphur	...	...	0.3	—	2.2	per cent.
Oxygen	...	...	21.50	—	23.50	per cent.

It will be seen that carbon constitutes more than one-half, and nitrogen about a sixth of the whole.

Classification of Proteins.

ALBUMENS.—Albumens are present in blood, milk, eggs, seeds, and bioplasm generally. The albumens differ but slightly from one another, and are named according to their origin. Thus, LACTALBUMEN is found in milk (but in small quantity compared with its chief protein caseinogen),

SERUM ALBUMEN in blood, whilst EGG ALBUMEN or OVALBUMEN constitutes the chief solid constituent of white of egg. Albumens are soluble in water, and are coagulated by heat as is familiar to us in the cooking of an egg.

GLOBULINS.—Globulins accompany albumens wherever these are found. The chief protein in muscle is a globulin, and the more important vegetable proteins belong also to this class. Globulins, like albumens, are coagulated by heat, witness the cooking of meat, but, unlike albumens, are insoluble in pure water. The addition of a small amount of salt to the water renders them soluble, and in this way they can appear in bioplasm, blood, &c., in dissolved form.

PHOSPHO-PROTEINS.—These are more complex than the two preceding, and, as the name implies, are rich in phosphorus. The most important phospho-protein is CASEINOGEN,[1] the chief protein in milk. Caseinogen is insoluble in water and dilute acids, but soluble in weak alkalies. If to a solution in weak alkali sufficient acid be added, the caseinogen is thrown out as a precipitate. This explains the curdling of milk when it sours or when acid is deliberately added to it.[2] Caseinogen in solution is not coagulated by boiling.

Another important phospho-protein is VITELLIN, which is found in yolk of egg.

NUCLEO-PROTEINS.—These are present in large amount in the nuclei, and, to a lesser extent, in protoplasm; they are also found in certain body-fluids, particularly in the bile of the ox.

The structure of the nucleo-proteins is extremely complex, as no less than two complete protein molecules are linked on to a complex acid called nucleic acid. This nucleic acid is itself fairly complex in structure, and, though not comparable with protein, has nevertheless several groups of bodies present, amongst which we may note a sugar, phosphoric acid, and some compounds of carbon, hydrogen, oxygen, and nitrogen, which are closely allied to uric acid. Nucleic acid united with one protein group gives NUCLEIN, with two protein groups, NUCLEO-PROTEIN.

The nucleo-proteins have many properties in common with caseinogen, for example, they are not coagulated by heat, are insoluble in water and weak acids, but soluble in weak alkalies.

GLUCOPROTEINS.—These are compounded of protein and a carbohydrate. The chief glucoprotein is MUCIN, the glairy adhesive material which is found in the inner wall of most canals and ducts of the body. It is present also in large quantity in the slime of snails and in the saliva of most mammals. If to saliva we add some dilute acid, the mucin is thrown out as a stringy precipitate, which can be redissolved by adding sufficient alkali. The solubilities of mucin are the same as those of caseinogen and nucleo-proteins.

CHROMOPROTEINS.—The chief chromoprotein is HÆMOGLOBIN, which is a compound of protein and a substance called hæmatin. This

[1] An unfortunate confusion exists as to the nomenclature of this protein. In England the term caseinogen is used for the chief protein of milk, and casein is restricted to the product of rennin clotting: in Germany, kasein is used for the former and parakasein for the latter. The Americans and some English chemists follow the German nomenclature. In accordance with the views of the committee appointed jointly by the Chemical and Physiological Societies of England the term CASEIN is used for the rennin product and CASEINOGEN for the unaltered protein as it occurs in milk.

[2] The reader must bear in mind the fundamental difference between the clotting of milk by an acid and the clotting produced by ferments, such as rennin. In the former case, the caseinogen is rendered insoluble by the acid, but is not chemically altered and can be brought back again into the soluble form. With rennin a distinct chemical transformation occurs, and the product casein cannot by any means be made to revert to caseinogen.

hæmatin contains iron, is rich in derivatives of tryptophane, and is red in colour. We find hæmoglobin in the red corpuscles of the blood, and constituting about 40 per cent. of their weight.

INFRAPROTEINS.—When proteins are treated with dilute acid or alkali in the cold, products called ACID-ALBUMEN and ALKALI-ALBUMEN respectively are formed. These are soluble in the acid or alkali employed, and do not coagulate on heating. If, for instance, a piece of meat is placed in dilute hydrochloric acid, a considerable part of the protein is dissolved out as acid-albumen; this acid extract can be boiled without formation of a coagulum, but, if it be neutralized with alkali, a curdy precipitate at once forms. If alkali be employed to extract the meat, the solution is rapid.

PROTEOSES, PEPTONES, and POLYPEPTIDES.—When protein undergoes disintegration into its component amino-acids, a number of steps can be traced by the loss of one true protein property after another. When coagulation by heat is lost, and when copper sulphate and potash give a rose-pink instead of a violet, the product consists of a mixture of PROTEOSES. When, in a further stage of disintegration, the property of being precipitated by ammonium sulphate is lost, and the substance can penetrate through parchment paper, the product is termed PEPTONE.[1] Below the peptones come the POLYPEPTIDES, which no longer give any distinctive colour with copper sulphate and potash, and finally the amino-acids themselves.

SCLERO-PROTEINS (called by some authors ALBUMINOIDS).—These are compounded of amino-acids, but, unlike the previously-mentioned proteins, contain little or no tyrosin or tryptophane. They are all insoluble in cold water, and are fairly resistant to chemical reagents. They cannot be substituted for protein in food, and are used in the body, as constituents of connective tissue, horn, hoof, &c., on account of their physical properties.

1. KERATIN, the basis of hair, feathers, horn, and the outer layers of the skin. It is very tenacious and resistant to chemical attacks. It contains more cystin, and, therefore, more sulphur, than ordinary protein.

2. COLLAGEN, generally present in the form of fine fibres or sheets which make up the greater part of connective tissues (see Chapter II.). Collagen is a colourless inelastic substance, insoluble in water, and of remarkable tenacity. When boiled with water, or treated with dilute acids, it swells up and changes into gelatine.

3. CHONDROGEN, closely allied to collagen, and forming the basis of cartilage (gristle).

4. ELASTIN, also closely allied to collagen, but differing in its physical properties. It is a highly elastic substance in the sense that indiarubber is elastic, and forms the basis of elastic fibres, such as are found in the *ligamentum muchæ*, &c.

VEGETABLE PROTEINS.—These, which occur widely distributed throughout all plants, and which are of special importance in connexion with the question of fodders, are partly globulins, partly albumens, and partly proteins which cannot well be classified. Some of them possess the remarkable property of being soluble in alcohol. Generally speaking, they are insoluble in water, and require much more salt for their solution than do the animal globulins.

[1] The article on the market called Witte's Peptone contains very little true peptone; it is chiefly a mixture of proteoses.

EXPERIMENTAL MAIZE PLOTS AT COLAC.

F. E. Lee, Agricultural Superintendent.

It is seldom that a better opportunity presents itself to emphasize the necessity and demonstrate the utility of proper cultivation and correct fertilization of a growing crop, than occurs in connexion with the present small experimental plots of maize, conducted by boys in the Colac and surrounding districts. Notwithstanding the many lectures that have at different times been given in country districts on the reasons for, and beneficial effects of, cultivation, there remains still a tenacious adherence to methods sanctioned by time, but otherwise having no logical or commonsense foundation.

PLOT CULTIVATED BY LESLIE SELWOOD.

When prices of produce were two or three times what prevail to-day, and land was perhaps one-half its present value, there was possibly some justification for methods demanding a minimum of trouble, but the world moves, and a newer set of circumstances demands improved methods, or the falling out of the race. With possibly this knowledge as the primary motive the Colac Progress Association was recently impelled to bring home to the rising generation of the district, the practical worth of advanced ideas applied to the ordinary practice on the farm. As might have reasonably been expected in such a locality where dairying is the paramount industry, the most obvious matter requiring investigation was the improvement of the yield of green-fodder crops and maize in particular for the continuous production of milk during the dry months at the end of the summer. The co-operation of two leading firms of artificial manure vendors was enlisted, one firm furnishing not only all manures to competitors free of charge, but donating also the substantial sum of £10 in cash for prizes.

It was required, however, that all competitors must have attended the short course agricultural classes conducted by the Department of

Agriculture, and must moreover have become the purchaser of the *Year-Book* published by the Department. It is sufficient evidence of the popularity of these classes to state that the original number of entries was nearly 50, of which no less than 28 crops survived accident and neglect, and, as indicated by the illustrations, attained complete maturity.

The prizes attached to the competition were on a most liberal scale, viz. :—

	£	s.	d.	
First prize	5	0	0	cash.
Second prize	2	0	0	cash.
Third prize	1	10	0	cash.
Fourth prize	1	10	0	cash.
Fifth prize	1	1	0	worth of seeds.

PLOT CULTIVATED BY DONALD RANKIN.

The fourth prize was for the best essay on the way the competitor actually grew his particular crop, manures used, &c. The area of the experiment, although small, being only 18 feet x 30 feet, was sufficient for the purpose.

The growing crop was required to be inspected by a judge, who would later award the prizes on the basis of quantity and quality of the shelled grain from the area.

The Appearance of the Plots in February.

The variety of seed uniformly used and furnished by the Department of Agriculture was "Yankee Doodle," one of a number of maize varieties recently imported from the United States, where it has the reputation of being a prolific yielder and capable of withstanding droughty conditions well. So far as could be judged at that period the variety appeared much more suitable than the one generally used by the farmer for his ordinary crop (mostly Ninety Day).

The seed having been hand planted in rows 3 feet apart had ample room for development, and in a number of the plots inspected was from

6 to 9 feet high, cobs forming freely and vigorously. The plots were in all manner of situations, some in the corner of the area sown by the boy's parent, some in backyards, and some within the playground area of

PLOT CULTIVATED BY RAYMOND COLE.

the State schools. Inquiry elicited the fact that the small plots had been hoed regularly, generally once a week, since the crops had appeared above ground. When it is stated that the natural rainfall between the dates of sowing and inspection was under half-an-inch, the preservation

PLOT CULTIVATED BY FRANK INGLIS.

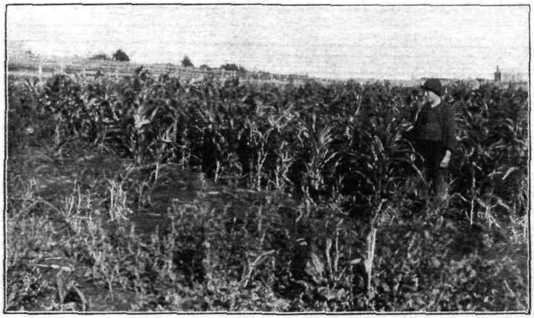
of the soil mulch can be credited with almost phenomenal powers. Those plots situated alongside the farmer's larger area of 5 or 6 acres stood out at least 3 to 4 feet above their surroundings and showed a greener colour.

It was especially remarked that whereas the farmer's own crop, which had either been sown broadcast or else had never been cultivated, had suffered severely from frost and the drying effects of wind, the small plots were not affected in the slightest degree. This immunity to drought and frost may be ascribed to the healthier and more vigorous development of the plants, enabling them to withstand abnormal climatic changes.

It was moreover remarked that some stalks showed promise of successfully devloping as many as six cobs, which is a prodigious number.

SOME OPINIONS EXPRESSED BY PARENTS OF COMPETITORS.

Naturally, where situated along the roadside, the maize plots have excited considerable attention from passers by, and in the friendly chaff



FOREGROUND AND BACKGROUND—A LOCAL CONTRAST.

of neighbours, utterance has been given to remarks which are calculated to exercise no small influence on the cultivation and manuring of future crops. One farmer wished "he had 50 acres of maize as good as his son's." Another "always knew maize would not grow through a dry summer, but as he had always broadcasted his seed, he could see now that it was a better way to drill it in and keep the cultivator going through it." Still another parent, had not previously come across the *Agricultural Journal*, which the entry of his son into the competition compelled him to subscribe to, and on reading it he found a fund of useful information relating to his business as a dairyman and farmer. These operations are eloquent testimony to the valuable lessons already taught by the competition. So widespread has the attention been that inquiries have been made from Sydney and other places as to the manner of carrying them out. The success of the competition confirms the Departmental belief that in country districts there is more than a passing chance of materially benefiting the local agricultural practice, by medium of small plots demonstrating the correct principles of cultivation, manuring and rotation, carried out it may be in the grounds of the local State school. The giving of a bent in the direction of rural life to the youthful mind and the demonstration of the fact that successful farming depends on the following out

of a set of unalterable natural laws will do more to elevate Australian farm practice than by any other means. The healthy rivalry between school boys will probably lead in after life to the desire to be known as the most successful farmer of the district, truly a position that might be coveted by all.

It is to be hoped that the worthy example set by the Colac Progress Association will be emulated by rural bodies throughout the State.

REPORT ON THE HARVEST RETURNS OF SPECIAL WHEAT AND OAT EXPERIMENTS.—SEASON 1906-07.

F. E. Lee, Agricultural Superintendent.

The establishment of experimental fields to test the benefits of artificial manures, both singly and in combination, formed part of the scheme of work carried out by the Field Branch during 1906. In the cases under review, artificial manures had previously been used, but their use left something more to be desired, and it was with the object of investigating what was lacking that these fields were laid down. The following are the results:—

Plot.	Manure.	Bushels per Acre.		
		Waubra.	Skipton.	Munro.
1	56 lbs. Superphosphate	23·5	7·2	13·8
2	84 lbs. do.	26·8	11·7	14·4
3	112 lbs. do.	27·0	15·6	11·2
4	No manure	19·3	3·9	4·8
5	56 lbs. Superphosphate and 28 lbs. Sulphate Ammonia	23·8	7·6	11·4
6	112 lbs. Superphosphate and 56 lbs. Sulphate Ammonia	27·3	12·0	9·6
7	56 lbs. Superphosphate ... / 28 lbs. Sulphate of Ammonia ... ... / 28 lbs. Potash Chloride	28·6	7·9	9·0
8	56 lbs. Thomas Phosphate	23·1	6·9	5·0

Waubra.—Mr. J. Smith, of Waubra, furnished 5 acres of land, the wheat sown being College Purple Straw.

It will be remarked that in plots 1, 2, and 3 the increased yield is progressive with the heavier dressings. The addition of 28 lbs. of sulphate of ammonia in plot 5, and of double that amount in plot 6 have done practically nothing to increase the yields produced by the superphosphate alone. It is, however, in plot 7, where the same manures as on plot 5 have been used with the addition of 28 lbs. of potash chloride, that we find a marked increase from 23.8 bushels to 28.6 bushels. This increase of 4.8 bushels can only be ascribed to the potash. At first sight it might appear curious that such a small dressing of potash could produce such a large increase in yield, but if reasons are sought for, it would probably be found that the inclusion of the three main elements of plant food (nitrogen, phosphoric acid, and potash) resulted in a more harmonious working, and each element

was enabled to perform its functions to the best advantage. The use of Thomas phosphate in plot 8 shows a return in every way comparable with that of the same amount of superphosphate in plot 1. The unmanured plot 4 shows a falling off of over 4 bushels per acre, as compared with the smallest dressing of superphosphate. As the cost of the superphosphate on plot 1 was only 2s. 3d. per acre, and 4 1-5th bushels of wheat are valued at about 11s. 6d., there is a very fair margin of profit. If we reckon the cost of the manures used on plot 7 at 9s. 6d. per acre, we will find a net profit of over 14s. per acre, reckoning wheat to be worth 2s. 9d. per bushel. These facts are indisputable, and serve to emphasize the necessity of grain-growers departing from the rigid plan of using one form of manure only. Manure dressings combining two or more forms would appear to well repay the slightly higher cost of application, and the attention of farmers in the central and southern portions of the State is pointedly directed to this fact. The exact combinations and proportions of each are matters for the attention of the farmer himself, and might require a year, or even two, of experiment.

Skipton.—The constitution and manure dressings of this field were identical with those of the one at Waubra. The seed was furnished by the farmer, Mr. J. Gardiner.

Here again the three dressings of superphosphate in plots 1, 2, and 3 show proportionate increases. The additional nitrogen in plots 5 and 6 has caused practically no increase in yield. It is most unfortunate that the yields from plots 7 and 8 were rendered worthless by being on wet land, the crop being furthermore injured by a hail storm and grubs. It is surely an eloquent testimony of what artificial manures can effect, when we see two plots, 3 and 4, side by side, the former yielding 15.6 bushels and the latter 3.9. The difference of 11.7 bushels, at 2s. 9d. per bushel, gives an extra money return of 32s., which, after deducting 4s. 6d. for the cost of the manure, leaves 27s. 6d. per acre net profit.

I desire to especially draw the attention of farmers to the wide difference in the yields produced by 84 lbs. and 112 lbs. of superphosphate. Many farmers think that it matters little whether they use 60, 80, or 100 lbs. of manure, but in that they are wrong. It does matter very seriously; for instance, the extra 28 lbs. of manure in plot 3 over plot 2 give nearly 4 bushels of wheat. The additional money cost is only about 1s. 3d. per acre, but the additional money difference is nearly 11s. *Verb. sap.*

Munro.—It would be difficult to find any soil less inviting or anything so opposed to local precedent as wheat-growing on the poor land in the vicinity of Munro railway station. Of a light sandy nature, the soil bears a scanty crop of natural grass, and is, moreover, moderately heavily timbered with she-oak and stringy-bark, and is alleged to be of poor stock-carrying capacity.

A piece of virgin land, 2 acres in extent, on Mr. W. Kirkham's farm, was cleared, grubbed, and ploughed early in 1906, and was sown with wheat in May of that year. In the light of the experience gained, it may be said that the most appropriate seeding would appear to be about 1½ bushels per acre. As offering a partial explanation of the lowness of the yields, it may be said that the wheat used was a Mallee variety, and hence unsuitable for the Munro district.

In this case the behaviour of the increasing dressings of superphosphate on plots 1, 2, and 3 has not been uniform. It was remarked in

every instance of heavy manuring on this field, that the growth of straw was stimulated evidently to the detriment of the grain. Confirmation of this is shown in the diminishing returns of plots 5, 6, and 7. The action of the Thomas phosphate has been disappointing, and little better than the unmanured section. The low return of the unmanured plot 4 was to be expected, but, at the same time, it is illustrative of what can be done by the aid of artificial manures. There is evidently a danger, when a crop is grown on this soil for grain, that over-liberal manuring may stimulate more straw than may be desirable, but if the crop is grown for hay, then the more liberal dressings might be given with advantage.

Other Fields.—Experimental areas of 5 acres were also established on the farms of Messrs. J. Down (Longwood) and J. English (Traralgon), both of which were failures, the former owing to an abnormally wet season, and the latter owing to the owner selling the property, and the buyer not being willing to continue the experiment, which was grazed off by stock.

Oat fields were also established on the properties of Messrs. W. Nickells (Drouin) and E. O. Francis (Stratford), the harvest returns of which are too poor to be of any value. Complete explanation of the causes of failure is furnished in each case.

An experiment of top dressing a crop at Stratford, planted two months previously, gave conflicting returns, which, in my opinion, are due to errors in weighing, which was carried out by the farmer himself.

Summary.—The above experiments may, on the whole, be said to have been successful, and will prove educative to the neighbouring land-owners in each locality. Indifferent preparation of the land is the principal cause of low yields, but in some cases, notably at Longwood, Drouin, and Traralgon, imperfect drainage would always militate against success.

"STAGGERS" OR "FORAGE POISONING" IN HORSES.

S. S. Cameron, M.R.C.V.S., Chief Veterinary Officer.

The somewhat extensive fatalities which occurred amongst horses at Carapooee, near St. Arnaud, during the early part of January, have served to draw public attention once more to the occurrence, at periodic intervals, of outbreaks of equine disease which a perverse public is pleased to designate as "obscure" or "strange." Nearly three years ago I collected and published information in regard to these periodic outbreaks which should have established, once and for all, that in them we had to deal with a disease well and definitely known, so far as diagnosis is concerned, both in Europe and America, but which had either only manifested itself at infrequent intervals in Australia, or had been wrongly diagnosed.

Since that time, characteristic outbreaks have occurred at Yarrawonga, Charlton, Minyip, Rochester, and other places, which have (or should have) been definitely diagnosed as Forage Poisoning or Staggers. Still, when in the St. Arnaud outbreak the symptoms, history, progress and surrounding conditions were such as are invariably associated with forage poisoning, the obvious diagnosis was publicly questioned, until the falsity of various theories concerning "salt poisoning," "cyanide poisoning," "silage poisoning," and the like was tardily realized.

Summarized, the history of the St. Arnaud outbreak is as follows:—A crop of oaten hay had been harvested and stacked towards the end of December. When the stack had been completed it was found that on the lowest land, which had been left till last, there were still about two loads of hay remaining in the paddock. This hay, the sheaves of which were heavy in the butt on account of the rank growth of moisture-weeds, was carted into the chaff house and immediately chaffed. The chaff was left in a heap, unbagged, and the feeding of it to the farm horses was commenced straightaway. Within a few days all the horses fed on it became ill; two died, and four others showed characteristic symptoms of staggers or forage poisoning, at the time of investigation into the affair by Mr. E. N. Wood, V.S. Prior to this anthrax had been suggested locally as the cause of the outbreak, and when the diagnosis of forage poisoning was communicated it was not regarded with sufficient confidence to prevent continuance of use of the suspected fodder. Hence the continuance of the outbreak until thirteen horses had become affected, eight of which died.

The only common factor in all the cases was the eating of the particular lot of chaff before mentioned. Those horses—and those only, and all of them—that had been fed on it became affected.

It would appear that something in the nature of an obscure fermentation or fungosis, giving rise to the formation of a toxic element, had proceeded in this distinct lot of chaff—how originating, wherefor arising, is beyond the present limits of scientific knowledge to determine; but the occurrence of which is, nevertheless, logically and properly deducible from the general facts associated with this and other well-studied outbreaks.

It is to be inferred that the month's delay of the representative people of the St. Arnaud district to accept the diagnosis, and to take the preventive steps which such diagnosis so clearly indicated, was due to the inability of its sponsors to demonstrate, microscopically or otherwise, the particular germ, mould, fungus, ferment, or what-not which was held to be the cause, and also to the added inability to prescribe completely effective treatment. If so, it may be well to say here that veterinary science is in exactly the same position in connexion with this disease on these two points as medical science is in regard to cerebro-spinal meningitis or "spotted fever," a disease of man allied to, or, it may be, identical with, "staggers" in horses. In neither disease has the exact causation been mastered, and, if anything, treatment is somewhat more effective in the equine ailment than in the human. It was an interesting coincidence that while this St. Arnaud affair was on the *tapis*, the daily cables were chronicling extensive fatalities from "spotted fever" in man in various cities of Great Britain; yet, though the inability of medical science to control its spread might be abundantly inferred, the medical profession at Home had not to suffer any unjustifiable charge of incapacity or scientific backwardness such as was levelled at the veterinary profession here.

The fact is that, until increased facilities for research in the domain of animal pathology are provided and fostered, stock-owners will have to remain content with the efforts which are at present being made available unto them; efforts which are, it may be, but partially effective at times, but valuable and honest always.

In the meantime, it may be well to re-publish the following article, which was written by me for the *Pastoralists' Review*, July, 1904, and

which, as above indicated, may be taken as epitomizing the present available information on the subject:—

"There has been reported, during the last few months, from various parts of Australia, a number of cases of the so-called 'spotted fever' of mankind. Technically, the disease is known as cerebro-spinal meningitis, *i.e.*, an inflammation of the covering membranes of the brain and of the spinal cord. So far as its course, symptoms, and morbid changes are concerned, this disease is identical with the cerebro-spinal meningitis of horses and other animals, which is known under the common name of 'staggers,' sometimes differentiated as grass staggers, stomach staggers, and mad staggers. This term has reference to the most prominent symptom, viz., a staggering gait produced by the want of co-ordinative power of the muscles resulting from the interference with nervous action caused by the pressure of inflammatory products at the base of the brain and spinal cord, or by derangement of the locomotor nerve centres. On account of outbreaks of the disease being in most instances associated with a particular set of feeding or grazing conditions, the disease is also generally known as 'forage poisoning.'

"The interest which has been created by the occurrence of so-called 'spotted fever' in widely-separated parts of Australia, and the fact that during the past year there have been two or three occurrences of disease amongst horses, and one, at least, amongst cattle in Victoria and South Australia, the history and character of which have been strongly suggestive of outbreaks of forage poisoning or staggers—these circumstances appear to warrant that interest will be taken in a short recountal of such reliable information as is available regarding the disease in animals.

"NATURE OF THE DISEASE.

"Neither the common name, staggers, nor the technical name, cerebro-spinal meningitis, conveys a correct idea of the nature of the disease. The former refers to one of the symptoms only, and the latter to a condition of inflammation of the brain coverings, which does not always exist—in the horse at all events. The disease is essentially an affection or derangement—probably a poisoning—of the large nerve centres, the brain and spinal cord, which are the principal seats of nerve-motor and nerve-sensory power. As a consequence of their derangement their functions are suspended or aberrated, and there succeeds a train of symptoms, all of which are connected with those functions of the body controlled by the nerves given off from the brain and spinal cord. Thus, according as certain parts of the latter organs are affected there will be paralysis or loss of muscular power, drowsiness and stupor, or great excitability, delirium, and madness. It used to be considered that these conditions were the result of irritation reflected by so-called 'sympathy' from the stomach or bowels to the brain or spinal cord, because in most cases there is some derangement of the stomach or bowels—either impaction, irritability, or some such trouble, hence the name 'stomach staggers.' But it is now known that these stomach symptoms are the effect, and not the cause, of the brain troubles.

"CAUSES.

"Experiments and observations by European veterinarians have forced the conclusion that the disease is caused by a germ, but, whether or not, the one giving rise to the disease in horses and other animals is

identical with that which is considered to cause the disease in man (the *diplococcus intracellularis meningitidis*) is a question that is still undecided. According to Nocard's latest work (1903), the German veterinary, Johne, concludes that they are identical, but Ostertag, another German, denies this, and Nocard remarks that 'the very incomplete descriptions furnished by Johne and Ostertag will not, from a bacteriological point of view, allow of the deciding of the question.' In the meantime, it may be observed that the disease changes in the brain in man and in the horse have not always everything in common. In man, inflammation of the brain covering (meningitis) is constant, but in horses it is not so, there being many cases in which no changes in the brain coverings can be discovered. The germ is supposed to belong to the family of 'moulds' or saprophytes, *i.e.*, those which usually live on dead matter. They exist in the soil, and are conveyed to the animal either by water, food, or bedding, but the exact mode in which the germ invades the body and penetrates into the nerve centres (brain and spinal cord) has not been determined. It has been suggested that it may pass direct from the nostrils through the nasal apertures (in the ethmoid bone) to the brain.

"When animals become affected while at grass, it is in that season of the year when the herbage is dry and ripe, and it used to be considered that in over-ripe grass there was developed, in certain seasons, a poisonous or narcotic principle, which caused the disease, in much the same way as prussic acid is developed in sorghum during certain stages of its growth. It is more probable, however, that when in a certain stage of ripeness or deadness the grass—more particularly rye grass—becomes attacked by the germ or mould which causes the disease. Amongst stabled horses, the disease attacks those housed in damp and badly-ventilated buildings, and the connexion between the occurrence of the disease and the eating of musty and mouldy forage, or the drinking of slimy water, has been in many cases distinctly traced. Under such circumstances, it will be easily understood how, without being transmitted from one animal to another by infection, the disease attacks a number of animals placed under similar conditions of food and water supply at the same time, and assumes the character of an outbreak.

"SYMPTOMS.

"Whatever may be still undecided regarding the pathological phenomena and nature of the disease, the records of observations regarding its symptoms and progressive manifestations are fairly complete and accurate. The usual symptoms are at first a drowsiness and aimlessness of movement, the appetite is not lost, but the animal eats slowly and mechanically, the breathing is slow, deep, and often snoring, pulse less frequent than natural, a sleepiness comes over the animal, which, if suddenly disturbed, is followed by shivering and evident excitement or fright. If made to walk, the gait is straggling, and there is want of proper control of the movements of the hind limbs, which are often crossed, the body wobbling meanwhile and sometimes falling. The animal places its head against a wall, or fence, or tree, or anything solid, and paws the ground automatically, or moves the limbs as if walking. These symptoms are succeeded by those of approaching delirium or convulsions. There will be great excitement, the head will be tossed; horses will whinny and cattle bellow; spasmodic twitchings of the muscles of neck, breast, and hindquarters will

be noticed. The legs and ears are alternately hot and cold, and perspiration is profuse. Violent convulsions now come on, the muscles all over become stiff and rigid, the eyes stand out fixedly, the limbs are stretched stiff, and the tail cocked towards the back; urine and excreta may be forcibly ejected. During the attack, the pulse is frequent and hard, and the breathing catchy and difficult. All this is succeeded by muscular relaxation and placidity, and the animal may relapse into a state of unconsciousness for a time. These alternations of frenzy and stupor may continue for a day or more, but, as the disease advances, the attacks are shorter and sharper, leaving the animal in an increasingly enfeebled condition until it either succumbs during a violent convulsion or collapses during unconsciousness. If the spinal cord is the seat of the affection, the paralysis of the limbs will be more pronounced, but, if the brain is involved, there will be paralysis of the muscles supplied by the cranial nerves; the lips and ears will hang pendulous, the tongue will be protruded, there will be loss of the power of swallowing, and snoring will be pronounced.

"In some cases in which the stupor is very great there may be no delirium; in others, the delirium is continuous, and the animal knocks itself about in a fashion beyond all control, and thus may sustain fatal injuries; in others, again, the convulsions or fits come on suddenly, without any warning and are often mistaken for symptoms of poisoning. In the two latter cases, death may occur in a few hours from attack, but in most cases it is two or three days before the symptoms which presage death are developed, or before signs of recovery are shown.

"TREATMENT.

"This is one of the diseases in which the beneficial effects of bleeding are often very marked. Bleeding from the jugular vein relieves the overcharged blood vessels of the brain, and so lessens brain pressure. From 4 to 6 quarts of blood may be abstracted with advantage in the early stages, but, later on, when actual inflammation has succeeded the congestion, blood-letting is useless, and even harmful. For the constipation which exists a purgative ball or drench may be given (for the horse—aloes, 6 drams; calomel, 1 dram; ginger, 1 dram. For cattle—Epsom salts, 1 lb.; powdered jalap, 1 oz.; tartar emetic, ½ oz.). Enemas of warm soapy water should also be given. For the delirium, extract of belladonna, in ½-oz. doses, is the most suitable sedative, and it may be repeated every few hours. It will be two or three days before there is any marked response to the treatment, and during this time the patient should be kept in a loose box, and disturbed as little as possible. Full recovery of the locomotive powers often takes a long time, but it may be hastened by the giving of ¼-oz. doses of iodide of potassium in the drinking-water; these assist in the absorption of any effusion at the base of the brain or in the spinal canal. A course of strychnine is also sometimes advantageous, but it should only be given under professional direction.

"PREVENTION.

"Having regard to the causes previously described, it will be obvious that for the prevention of the disease or the suppression of an outbreak change of food or pasture and of water supply is essential. Amongst stabled animals, attention should be directed to the removal of any unwholesome conditions of drainage, filth, mouldiness, or dampness."

THE AGRICULTURAL HIGH SCHOOL.

J. H. Betheras, M.A., Inspector of Schools, Warrnambool District.

In the establishment of Agricultural High Schools there is a fine opportunity to "Ring out the old, ring in the new" in educational aims and methods of their attainment, to lessen the scholar's burden by discarding everything that does not tend to development of interest, power, and useful knowledge, and to take him straight along the road that leads to an active, useful, progressive life. The new school need not be trammelled by tradition that culture means an easy and dignified repose from work, that farm life is essentially dull and uninviting, hard and mind-deadening; it should seek to exalt the doer, to greaten and glorify a cultivated common sense in matters of field labour, and to place success in the science and practice of agriculture in the very forefront of our country's satisfaction.

The school must be for *training* rather than for *learning*. In the near future, a much greater honour will be given to every resourceful man of action. The direct aims of the Agricultural High School include the following:—

1. To give to boys such education as will direct their interest specially towards the land as an excellent means of gaining a livelihood; and, further, to afford the practical experience and scientific training necessary for success.

2. To magnify agriculture as an occupation and a profession. The boy may leave the school as an interested labourer, or for further study and practice in Experimental Farm, Agricultural College, and University.

3. To provide a central institution for the dissemination of agricultural information by evening lectures, conferences, and literature.

4. To superintend the Government experimental plots, to record and interpret the results.

5. To provide a Summer School in Agriculture for primary school teachers.

To insure success, it is necessary to weld together the efforts of the different assistants, the directors and administrators, the local Advisory Board, the teaching staff, honorary helpers and general public. There must be a supply of well-trained teachers, a carefully-prepared syllabus, an up-to-date equipment, a reference library, a reasonable examination, and a preparation in the primary school, especially in a proper organization of nature-study and school-gardening.

The Advisory Board is of great importance, more particularly in the establishment of the school. It may be at first a local committee, widening afterwards into a Board representative of the district agricultural and kindred societies, town and shire councils, farmers, and general public. Its work will be to arouse public interest in the need for such a school, to satisfy the Government requirements, and to enrol scholars; afterwards to keep in touch with the Departments of Agriculture and Education, and act as advisers in matters pertaining to the welfare of the school; to select farms and dairies for the visitation of the scholars; to arrange for evening lectures by honorary and other helpers; to hold farmers' conferences; to superintend the expenditure of the maintenance allowance. The experience at Warrnambool showed the value of such a committee in overcoming the many difficulties which arose by the way. It had the advantage of being guided by the energetic and influential mayor of the town,

Mr. G. S. Mackay. By the personal efforts of the members of committee; public inertia and opposition to scientific instruction as such were overcome; pockets were reached; parents were persuaded to allow their boys, so useful at home, to be enrolled as scholars; and with the aid of an efficient lecturing staff and by means of circulars information as to the scope and aims of the school was sent to all parts of the district. It was by no means an easy task. It should be mentioned that the A.N.A. Society rendered good assistance to the committee. Among the reasons assigned for the need of such schools were the following:—

The advance of other countries in obtaining school power in the direction of agriculture and the splendid results obtained thereby;

the consequently keener competition to which the coming farmer will be subjected in every open market;

the need for intense cultivation and for a more uniform and better quality in production;

the desirability of changing the attitude of boys to city life and positions by giving them an interested knowledge of the country, of farm occupations, and of machinery;

the value of capable, well-informed labourers, and of scientific experts;

that a large body of progressive agriculturists means an increased wealth to our country;

that interest and knowledge will make farm life attractive and satisfying.

The intention is to catch the scholars young, and give early a rural bias to their inclinations. The children in the lower classes of every State primary school have nature-study as a subject of the ordinary course. This is not the old object-lesson under a new name, but is "nature studied in its relations by the child from the child's standpoint by the teacher with the children." It makes the child know and love his surroundings; it leads him to appreciate what he receives from nature, and what he owes to nature. Each child becomes an interested investigator.

The Director of Education strongly encourages the school garden as a necessary adjunct to every school. As an educative agency, the school garden has great possibilities, but much of the teacher's energy has been wasted for lack of systematic organization and expert superintendence. Seeds and trees have been planted, in many cases without due regard to satisfactory experiment or design, and consequently with not a tithe of the good that should have resulted from the labour. However, the interest has become so general that there are now but few Victorian schools where the children have not more or less pride in their garden plots. It is to be hoped that an organizer of school gardens, as recommended by the Director of Agriculture, will soon be appointed, and will systematize and direct the efforts of teachers and scholars.

The senior classes in the State schools may, if the teacher wishes, take agriculture as the science subject. In schools where this is being done, the results are gratifying. A handful of soil has become an object of interest; it is a storehouse, it is a laboratory. Teachers and children display special liking for the lessons; the school life is connected with the home life; the children are in contact with real life and its betterment; they have a manual training and get good physical exercise; they learn to respect labour and the labouring man; their mental alacrity and reasoning powers are developed; the whole school life is quickened; there are direct,

personal observations, school excursions to farm and field, simple experiments, practical training and studies in theory. Some experiments made by the scholars of the Mortlake State School are given as examples:—

1. (*a*) Placed pulverized local rock in well-drained pot. (*b*) Placed pulverized local rock with some decayed organic matter (rotted weeds) in another pot. Sowed bean in each. In (*a*) the plant died at the end of six weeks; in (*b*) plant attained maturity and produced ten well-filled pods.

Deduction.—(*a*) Local basaltic rock contains all plant foods except organic matter; (*b*) organic matter is necessary to soil in order that the soil organisms (bacteria) may assist plant.

2. Placed equal weights of sand, and of clay mixed with sand, in two tins. Same weight of water was added to each; tins were exposed to air for a week. The mixed clay and sand was found to be the heavier.

Deduction.—Evaporation is greater from sand than from a mixture of sand and clay.

3. The above experiment was performed without the added water. The tins were exposed for one night, and were weighed in the morning. The mixture was heavier than the sand alone.

Deduction.—(*a*) Clay in soil assists its absorbing power; (*b*) soils absorb moisture from air.

4. Placed bean seeds with embryo up, on side, down; seeds with embryo down appeared first above the ground; seeds with embryo on side were next.

5. Experiments with potatoes. Sets cut; some were placed with "eyes" upward, others downward. In every case those with "eyes" upward appeared above surface of ground from 5 to 14 days before the others.

6. In March, planted potatoes at varying depths, 3 inches, 5 inches, 8 inches. Those planted at 8 inches came up first, then those at 3 inches; many of those at 5 inches failed altogether.

The potatoes at 8 inches received benefit of dampness conserved below. A slight shower moistened surface 10 days after planting and helped the 3 inches potatoes.

7. Placed an India-rubber tube over cut-off stem of balsam. Attached a glass tube; poured small quantity of water in tube. In 36 hours, sap had risen in tube ¾ inch. Showed effect of root pressure.

8. Stripped off all leaves from hardwood plant; in some instances death followed. Stripped off all leaves from soft-wood plant—none died.

Deduction.—Hard-wood plants depend almost entirely on leaves for breathing and digesting food; in soft-wood plants this work is also performed by the stems.

9. Cut four kerosene tins into halves, two transversely, two longitudinally; put same weight of soil in each; added to each same weight of water (stirring soil well). In Numbers 1 cut transversely and 2 cut longitudinally, the surface was stirred daily for 14 days; in the other tins the surface was not stirred. At end of time, Number 1 weighed the heaviest, Number 2 next.

Deduction.—Surface stirring breaks capillaries, and acts as a mulch, preventing evaporation. Deep cultivation tends to assist in conserving moisture.

10. Performed experiments with wheat, oats, barley, and mangolds. In every case, deep cultivation gave results, varying from 1½ to 4 times the weight of material over shallow cultivation.

11. Performed experiments with millets. Those in which the surface was stirred to a depth of 3 or 4 inches averaged 4 feet high, and those with no surface-stirring averaged 2¾ feet.

12. Experimented with fertilizers. Crops all responded to the addition of phosphates, but showed no improvement with potash.

13. Cauliflowers and brocoli in July formed much larger heads when cincturing was performed than in the case of those where the operation was not performed. Cincturing was done at the time the flower was just forming.

It is thought that by this linked instruction in nature-study, school gardening, and elementary lessons and experiments in agriculture very many pupils of the primary school will be induced to proceed to the Agricultural High School. There a great deal will depend, of course, on the efficiency of the teaching staff and the teaching methods employed. The headmaster ought to be in close touch with the Departmental and other agricultural experts, and in correspondence with similar establishments in other countries. He ought to be allowed opportunity to see for himself what is being done in other agricultural schools and colleges.

In the exit examination, the value of the student's work will probably be estimated from the headmaster's report, the farm manager's report, and the result of examination by an outside expert.

The syllabus of the Agricultural High School is as follows:—

PRINCIPLES OF AGRICULTURE.

The soil, its origin, elements and resources, its texture, moisture capacity, tillage and enrichment. Trees on the farm.

Plant food of the soil and its relation to (*a*) Bacteria, (*b*) The higher animals.

Victorian soils.

Cultivation of cereals, grasses, fodder plants and vegetables.

Rotation of crops. Fertilizers. Drainage and improvement of soils.

Irrigation.

Feeding and general management of farm live-stock. Ensilage.

First aid to animals.

General principles of the valuation of—

- (*a*) Fertilizers.
- (*b*) Milk and cream.
- (*c*) Farm crops.
- (*d*) Animal products.

AGRICULTURAL SCIENCE.

Each section includes laboratory practice. Special attention will be paid to practical work. All scholars must keep laboratory note-books.

1. PLANT-KNOWLEDGE.—

Such an amount as is contained in an elementary work such as Gillies's *First Studies in Plant Life in Australasia*, together with an outline of the nutrition and respiration of plants; an outline of the life-history of a moss, a mushroom and a fern.

Structure of the higher plants, root, stem, leaf, fungus, flower, fruit.

Physiology of plants, absorption, elaboration and utilization of plant food. Reproduction.

Cross-fertilization. Diseases of plants. Plants detrimental to Agriculturists.

2. ANIMAL-KNOWLEDGE.—

The course will include lectures and demonstrations on animals beneficial and injurious to the agriculturist. The following will be studied in detail: A one-celled animal *e.g.* amœba or paramœcium, liver-fluke, earthworm, snail, grasshopper, blights, scales, ladybird, bee, ant, wasp, codlin moth, wireworm, apple-borer, and other common local insects. The spider, tick, fish, frog, bird, domestic fowl, rabbit, sheep, horse, cow, pig.

3. CLIMATOLOGY.—

The seasons. Atmosphere. Forms of water. Thermometer. Barometer. Hydrometer. Systematic weather observations. Weather predictions. The weather of Victoria and its causes.

4. PHYSICS.—

Measurement of velocity and capacity. Acceleration. Laws of motion. Mass. Weight. Specific gravity. Momentum. Force. Principle of moments. Equilibrium. Measurement of work. Matter. Energy. Power. Transmission of pressure. Boyle's Law.

Pump, artesian well, cream-separator, Babcock's tester, milking machine, farm implements.

Heat and temperature. Specific and latent heat.

Expansion, evaporation, ebullition.

Convection, conduction, radiation.

5. CHEMISTRY.—

Practical exercises in the following:

Common materials, water, principal salts, rocks and earths.

Properties of liquids and solids. Acids and their properties.

Air and its properties. Acids and metals. Rusting of iron.

Burning. Limestone. Ammonia and other alkalies.

Interaction of acids and alkalies.

Equivalent weights. Hydrochloric acid and chlorine.

Combination by volume. Molecular weights. Carbon and its compounds with oxygen. Common organic substances, *e.g.* sugar, starch. *Compounds of nitrogen. Sulphur and its compounds.*

Phosphorus and some of its compounds.

The chemistry of carbonate of lime and quicklime; common salt; sodium; caustic soda and sodium carbonate; sulphurous acid, sulphuric acid, hydrogen sulphide, sulphur and sulphates; magnesium, magnesia and magnesium sulphate; bone-ash, and phosphoric acid; clay, silica and alumina.

The fundamental chemical laws. Use of chemical formulæ and equations. Simple chemical calculations.

Geography.

PHYSICAL.—

Simple methods for determining the shape and size of the earth; changes of time and place of sunrise and sunset.

Meridian altitude of sun at different times.

Movements of the earth; proofs and effects of its rotation and revolution. Determination of latitude and longitude by simple methods. Conditions governing climate. Trade winds, land and sea breezes, monsoons, cyclones, anti-cyclones.

Buys Ballot's *Law of the Winds.*

The principal ocean currents.

Rivers, river-valleys, history of a river-valley. Springs and wells.

Description and mode of formation of the principal land forms.

Rocks of the crust. Sedimentary. Igneous. Metamorphic: their description, formation and relation to soils.

Geological succession of the stratified rocks of Victoria.

Disturbance of strata. Weathering.

The physical structure of Victoria and the continents.

Study of the locality. Field excursions.

POLITICAL AND COMMERCIAL.—

A knowledge of the important political divisions of the world; their economic products and their area relative to Victoria.

Chief trade and cable routes from Australia.

Australian imports and exports with their places of origin and consumption.

Mapping; Australasian States; Australia.

Farm Practice.

The farm will be worked and cultivated in such a way as to illustrate the practical application of the principles laid down in each section of the syllabus. The farm will be also used by the Department of Agriculture as a centre of experimental work. Every effort will be made to have the interest of the progressive farmers of the district focussed upon the work of the farm.

English.

Grammar. Accidence. Analysis.

Composition. Correspondence. Essays, reports, abstracts.

Bookkeeping. Double entry. Farm accounts. Farm records. Records of farm experiments.

Literature. Study of prose and poetry as for Junior Commercial Examination.

Directed reading of bulletins and magazine articles relating to agriculture.

Mathematics.

ARITHMETIC.—

Invoices. Fractions, decimal and vulgar; percentages; insurances; profit and loss; interest; stocks; averages; square root; approximations.

MENSURATION.—

Plane rectilineal figures, circle, solid figures; excavations; earthworks; haystacks; silos; water flumes.

MEASUREMENTS.—

Timber, logs and planks; measurements by chain and compass of straight lines; angles; areas.

Solution of triangles.

Plane-table surveying.

ALGEBRA.—

Elements of algebra. Factors, fractions, simple equations, quadratic equations, problems.

Drawing.

FIRST YEAR.—

Model drawing and drawing from objects and from nature, on blackboards and on paper. Practical geometry, plain and solid, and its application in drawing to scale, simple plans, elevations and sections.

SECOND YEAR.—

More advanced model drawing and explanatory sketching.

Elementary mechanical drawing and elementary building construction, to be connected with the practical wood-work and metal-work executed in the school work-shops.

SLOYD AND FARM-HANDIWORK.

During the first year, students will work through a slightly modified course of Sloyd wood-work as practised in State schools, and, when they have gained sufficient knowledge of and dexterity in the use of tools, will proceed to more difficult exercises including the joints and a study of the methods used in constructing farm-buildings and the construction of such models and articles as may be included in the general term " farm-handiwork."

TAKE-ALL AND ITS CONTROL.

G. H. Robinson, Assistant to Vegetable Pathologist.

A dry summer followed by a wet winter seems to afford the most favorable conditions for the development of take-all and whiteheads in our wheat crops, diseases which have been shown to be due to the attacks of a fungus known as *Ophiobolus graminis* Sacc. Take-all is the result of a virulent attack of the fungus, arising from infection at a very early stage in the life of the wheat plant and it is scarcely possible to mistake the disease for any other. If patches, not being clay pans, are seen on which nearly all the plants are dead, a number of stools both large and small should be lifted and the earth carefully washed away from the roots. If in a considerable proportion of the plants thus washed the butts for an inch or so appear quite black and low down on the inside of the outer sheaths small black bodies about the size of pinheads are seen, then it is practically certain that the take-all fungus is the destructive agent, particularly if the roots have a tendency to break off close to the butt when the plants are pulled. The blackened appearance of the butt, it may be noted, is much more easily seen when quite wet. A milder attack of the fungus, producing the disease known as whiteheads, is not so readily recognised since it is often confused with tip-burn, a condition in which the upper portion of the head turns white and fails to produce grain while the lower portion of the ear yields normal grain. In whiteheads however the whole of the ear is white and of much the same colour as the rest of the plant and what little grain is produced is poor and shrivelled. Tip-burn thus is the death of a portion, rarely the whole, of the ear, the other parts of the plant remaining alive, and is due to a scorching wind during the flowering period, while in whiteheads the whole plant dies as the result of the attack of a fungus on the roots and base of the stem.

Though much has been done in working out the life-history of the take-all fungus, still our knowledge is incomplete, and as a consequence the measures recommended for its suppression might perhaps be improved upon as the result of sustained investigation and experiment under ordinary farm conditions. Laboratory work is an essential to success, particularly in the early stages of an investigation, but sound practical measures for

the control of diseases are what our farmers and fruit-growers require and these can only be devised as the result of comprehensive field experiments.

At present we know that the take-all fungus produces little black flask-shaped bodies, called perithecia, on the sheath of the wheat, containing an immense number of spores, and these spores are capable of germinating at once if sufficient moisture and air be present. As was shown by experiment three years ago if diseased stubble be placed in a pot and healthy wheat sown with it, the young seedlings are seen to be diseased almost as soon as they appear above ground, and in as short a time as two months from date of sowing the plants may be all dead and their blackened butts covered with the perithecia of the fungus. Thus if wheat be sown on land bad with take-all the previous year we may expect the resulting crop to be diseased, in all probability much worse than in the first case, since the conditions favoring germination of the seed also favour germination of the spores. As this result invariably occurs in farming practice it is clear that the disease known as take-all arises from the spores of this fungus remaining in the ground from the previous year.

Some consideration will be given to the methods generally adopted for combating the disease and an effort made to show the reasoning on which they are based. Summed up the measures may be described as starving the fungus, which is achieved as follows:—

(1) Avoiding wheat after wheat.
(2) Burning badly-affected stubble.
(3) Early fallowing with thorough working after rain.
(4) Replacing wheat with some crop, such as oats, not liable to the disease.

THE VALUE OF EARLY WELL-WORKED FALLOW.

Of late years the practice of taking off only one wheat crop every three years has become fairly general in the Northern districts, the stubble being allowed to stand after harvest, such feed as may spring up serving as pasture. In the second winter or spring succeeding the wheat crop, the land is fallowed and in the following autumn wheat is again sown. This year take-all has been worse than in any year since 1903 when the first wet season after the drought was experienced. Bearing in mind the frequent practice of one wheat crop in three years we find that many of the paddocks in which take-all was so bad this year were seriously affected in 1903. Taking such a paddock to illustrate our argument the conclusion is obvious that the fungus has by some means survived in that land for three years, for we are certain it is not carried by the seed. What we have to find out is, How has it survived? We have a few facts to guide us in seeking an answer to this question but must depend largely on conjecture. We may dismiss at once the possibility that any of the spores produced on the wheat stubble of 1903 have survived till the autumn of 1906 and then infected the newly-sown wheat, for the remains of that crop, stubble, fungus, and all, must long since have been merged into the general substance of the soil. Of course during the year the paddock was in grass there must have been a number of self-sown wheat plants many of which would be diseased. These would give us, on their dead remains, spores in the autumn of 1905, capable of attacking wheat but there is no likelihood that there were any *living* wheat plants in the paddock during 1905 for these spores to attack, so that unless the fungus was able to grow on some plants other than wheat it would be starved out, hence we should expect a year in grass

and a year in fallow to banish the disease. This, however, as all farmers know is not often the case but an explanation is afforded by the fact that two, at least, of our most common grasses, both practically worthless or at best not so valuable as others capable of growing under similar conditions, are known to be attacked by this fungus. They are the spear grass (*Bromus sterilis*) and barley grass (*Hordeum murinum*) while a third, sometimes called silver grass (*Festuca bromoides*), is strongly suspected of being affected also. The two former unfortunately are rarely if ever absent from our wheat paddocks, and it would be safe to say there is no district in Victoria where they are not abundant. These two grasses known to be attacked form a considerable proportion of the herbage springing up in stubble paddocks, while the silver grass is far and away the most common on such land. Doubtless spear grass and barley grass serve to carry over the disease, in cases such as that cited, to the autumn of 1906, furnishing spores ready to attack the newly-sown wheat. But, some may argue, the bare fallow in 1905 would have destroyed all the grass long before the wheat was sown. Certainly after a year as pasture an *early fallow before any of the grasses had time to mature their seed or the fungus to produce its spores*, a fallow well worked through the summer, would go a very long way towards starving out the fungus, but owing to various causes much fallowing is done too late to be of any service in this direction and still more, perhaps, is never touched at all till just before seeding. A late fallow permits the fungus to mature its spores on the grass and these spores would form the source of infection for the crop sown in 1906. Hence the importance of early fallow to check take-all and the uselessness of a late one.

Working the land after rain through the spring and summer is almost as important as earliness in fallowing. Even in an early fallow there is the probability that a few autumn-grown grass plants would have a small proportion of spores formed on them and the only way to destroy these spores is to set up conditions similar to those existing in a good seed bed. By working the land after rain air is admitted and moisture conserved, furnishing conditions favorable to the germination of these spores and since there is nothing for them to grow upon they soon perish. On the other hand if the ground remains unworked it quickly becomes dry and hard so that it would be impossible to conceive conditions more favorable for the preservation of these spores uninjured and in a fit condition for attacking newly-sown wheat in the autumn.

BURNING STUBBLE.

Burning stubble is not such a common practice as it once was, the growing recognition of the value of the straw being responsible for the change. Badly affected paddocks are best burned off, but this operation must be carried out with some understanding of the object in view, the destruction of the spores of the fungus. In the first place the usual method of burning off is quite useless, since the take-all patches being almost bare of anything in the way of dry straw a proper burn is never obtained over the parts where it is wanted but only where the disease has not appeared. The harrows should be run over the stubble to draw straw to the bad patches and the burn off accomplished as early as possible in the season.

REPLACING WHEAT WITH A CROP NOT LIABLE TO THE DISEASE.

Oats are frequently grown after a badly-affected wheat crop often with considerable success in starving out the fungus but occasionally the results

are unsatisfactory. We know that the fungus cannot grow upon oats and its reappearance after oats in some cases has led to doubts being cast upon this method of controlling the disease. These varying results no doubt arise from the different conditions under which the crop may be sown and the cleanness of the seed. In the first place the seed of spear grass is present to a greater or less extent in practically all samples of oats. Hence as a rule a proportion of spear grass is sown with the oat crop and as there is already some in the soil of nearly every paddock we are not pursuing a wise course in sowing oats after wheat and then wheat again without an intervening fallow. By all means use oats where practicable but be careful to sow clean seed free from spear grass and preferably after an early fallow and not directly after wheat. Sometimes however it becomes necessary to follow wheat with oats in which case wheat should not again be sown without an early fallow in between. In very badly infected paddocks it is well to replace wheat with oats for once in the ordinary three-year rotation of grass, fallow, crop, the succeeding treatment depending largely on the nature of the season and the financial requirements of the farmer.

Take-all on New Land.

One point alone remains to be discussed and that is why land never in wheat before sometimes gives a crop badly affected by take-all. There can be only one explanation and that is that the grasses which it carried before must have borne the disease. The necessity for *early* fallow is again shown and thorough working to prevent the growth of weeds which may carry over the fungus, and to cause the germination and destruction of the spores.

Conclusions.

From what has been already said regarding the prevalence of the disease on spear grass and barley grass which are practically always present in our crops and on our headlands there would appear to be no use in allowing affected paddocks to remain in grass for one year in three so far as destroying take-all is concerned. It would be a much more rational course to burn off the stubble thoroughly and fallow early, work the land well and then put in oats to be followed by another fallow and then wheat. The second fallow might be omitted if the season promised well and the autumn rains had been sufficient to insure a good germination of the self-sown oats and various weeds. Of course where rape or any other green crop can be grown with any degree of success it might be used in place of oats since it would answer as well or better. The only reason for suggesting oats is that on a large section of our wheat lands the growth of any crop but a cereal has been regarded as next to impossible, and this one at least is not susceptible to attack by take-all.

To sum up as far as our present knowledge goes take-all can only be controlled by starving out the fungus which causes it, and this is best done by fallowing early and working the land thoroughly after rain and for a time replacing wheat with some crop not subject to attack. For each and all of these measures there are sound reasons as we have seen, and the degree of success achieved will depend largely on the care bestowed on the work.

Note.—Bulletin No. 9 on "Take-all and Whiteheads in Wheat," with illustrations, can be had gratis on application to the Secretary for Agriculture.

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LAMENESS IN HORSES.

S. S. Cameron, M.R.C.V.S., Chief Veterinary Officer.

(*Continued from page 220.*)

ELBOW LAMENESS.

ELBOW LAMENESS is not very common in horses. It may arise from rheumatic or other disease of the joint; from sprain of the ligaments supporting and binding the joint or of the muscles attached in its vicinity—which latter usually occurs as a result of accidental slipping; or from fracture of the head of the small bone of the forearm (*ulna*) which constitutes the "point of the elbow" and which is the seat of that common and unsightly blemish known as "capped elbow."

SYMPTOMS.—From whatever cause arising elbow lameness is characterized by the following symptoms:—

(*a*) The horse stands with his knee raised and bent; the toe rests on the ground, the limb being apparently useless.

(*b*) When the animal is moved he makes a sudden drop on the sound limb and appears as though he would fall at every step; there is a jerking kind of motion in the joint and the limb is greatly bent at the knee when the weight is thrown upon it.

(*c*) When it is "the point of the elbow" that is injured the horse is able to stand quite well, but is lame when moved.

(*d*) There is generally heat, pain, and swelling in the region of the joint.

TREATMENT.—The principles of treatment laid down for shoulder lameness should also be followed in regard to elbow lameness.

CAPPED ELBOW seldom causes lameness. Although an unsoundness it is the result of an injury and will be more fittingly dealt with under that heading.

DISSECTION OF FORE LIMB OF HORSE.

Fig. 2.—Muscles of the fore limb—external view; *a*, antea-spinatus; *b*, postea-spinatus; *c*, teres externus; *d*, caput magnum; *e*, caput medium; *f*, flexor brachii; *g*, extensor metacarpi magnus; *h*, extensor metacarpi obliquus; *i*, flexor metacarpi externus; *k*, extensor pedis; *k'*, its tendon; *k''*, fibrous band from the suspensory ligament; *l*, extensor suffraginis; *l'*, its tendon. (After Strangways.)

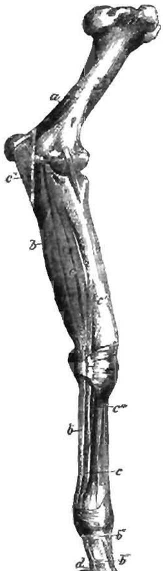


Fig. 3.—Internal view of the deep muscles of the fore limb; *a*, caput parvum of triceps extensor brachii; *b*, flexor pedis perforatus; *b'*, its tendon; *b'' b'''*, slips to the pastern bones; *c c*, flexor pedis perforans and its tendon; *c'*, radialis accessorius; *c''*, ulnaris accessorius; *c'''*, inferior check ligament; *d*, perforans tendon leaving the sheath formed by perforatus tendon. (After Strangways.)

KNEE LAMENESS.

Sprain of the Superior Check Ligament.

Just above and behind the knee there is a short broad band of fibrous tissue, springing from the tendon of one of the large flexor muscles of the foot (*flexor pedis perforatus*) and running downwards to be attached strongly to the lower and back part of the bone of the fore arm (*radius*). It is intended apparently to prevent the muscle from being subjected to overstrain—hence the name of "check" ligament. The strain put upon this ligament by the immense muscular power exerted by draught horses when pulling heavy loads up hill is sometimes such as to cause it to be sprained; in which case pronounced lameness results. It is but seldom that this form of lameness develops in light horses, and when it does it is usually of rheumatic origin.

SYMPTOMS.—The lameness is most often accompanied by obvious pain, heat and swelling. The animal stands with the knee slightly flexed and toe resting on the ground; he has great difficulty in flexing the knee joint, and when this is done forcibly the acuteness of the pain is made apparent. When moving, the animal "goes on the toe"; he avoids putting weight on the heel or allowing it to touch the ground as that would put the muscle and check ligament on the stretch and cause pain.

TREATMENT.—Strict rest should be enjoined; and in the first instance when the symptoms are most pronounced the treatment should be directed to the subjugation of the inflammation by hot fomentations applied in the manner described at page 77. A high-heeled shoe should be put on to relieve the strain on the injured ligament, and cooling medicine should be given in the food. Later on cold applications should be used—frequent hosing or allowing cold water to gently trickle on to the part from a hose bandaged in position. When the acuteness of the symptoms has subsided a blister and lengthened rest should be prescribed. Complete recovery from the lameness may be confidently expected, but the horse should not again be used for purposes involving strenuous pulling; otherwise the lameness is very likely to recur.

Thoroughpin of the Knee.

This consists in a puffy enlargement on each side of the limb just above the knee, caused by a distension with synovia of the sheath through which the flexor tendons pass. The distension may be pressed from side to side; pressure on the outside enlarges the inside distension and *vice versâ*. The condition is often associated with, and may result from, sprain of the superior check ligament, and if it is accompanied by lameness the same symptoms are exhibited and the same treatment may be applied. It is, however, usually a chronic condition without actual lameness; and the only treatment that is of any avail in regard to reduction of the swelling is a lengthened spell at grass and repeated blisterings with red mercury blister. If the horse is kept at work, tight bandaging at night over the enlargements tends to reduce them somewhat. "Aspiration" (*i.e.*, sucking out the fluid with a syringe), as also "puncturing" are sometimes practised when the contained fluid has not become coagulated or flaky. Such operations can only be successfully performed by the skilled veterinary surgeon, who will see that they are carried out aseptically and that the necessary subsequent treatment is appropriate and properly conditioned.

Speedy-Cut.

This is an injury, sometimes involving great lameness, inflicted on the inner aspect of the knee. Speedy-cutting is allied to "brushing," and occurs in "in-knee'd" and "lady-toe'd" horses with free action, the part being struck by the inside or shoe of the opposite foot. The bone is frequently injured and an abscess may form. A thickening of the skin and subjacent tissues often remains permanently. This thickening increases the liability of the part to be struck by the other foot, and a speedy-cutting horse may become practically useless. He is very often lame, and becomes unsafe for either riding or driving.

To PREVENT the injury a leather boot may be worn on the knee, and care should be taken that the shoe does not protrude beyond the horn level of the wall on the inside.

TREATMENT should aim at reduction of the inflammation in the first place, to be followed by red mercury blisters. In case of abscess formation an incision should be made at the lowest part so as to allow of drainage of the cavity. An injection of glycerine (8 parts) and tincture of iodine (1 part) may then be used and the parts bandaged moderately tight.

Spavin of the Knee.

This consists in a bony formation and enlargement between the head of the inner splint bone and the lower bones of the knee. Its occurrence is often due to the same causes as produce splints, and the lameness which it causes greatly resembles splint lameness and may be treated in the same way.

Capped Knee.

This is a condition in which there is a chronic enlargement in front of the knee. It may be brought about by the puncture of a thorn or like foreign body, but is most commonly associated with that condition known as "rail rap" resulting from the "hitting" of fences or other form of violence. On this account and also because it seldom causes lameness it will be more properly dealt with later on under the heading of injuries.

Broken Knees.

This condition of the knee has also greater claims to be considered under another heading—that of wounds.

SPRAIN OF THE "BACK TENDONS."

This term is applied to three different conditions which for reasons of a practical character it is as well to keep separate. They are:—

I. SPRAIN OF THE INFERIOR CHECK LIGAMENT.

II. SPRAIN OF THE TENDONS OF THE FLEXOR MUSCLES (*flexor pedis perforans* and *flexor pedis perforatus*).

III. SPRAIN OF THE SUPERIOR SUSPENSORY OR SESAMOIDEAN LIGAMENT.

All these structures are situated behind the cannon bone between the knee and the fetlock, and during severe exertion they are subjected to a considerable amount of strain which when over-applied results in a sprain, causing lameness. There are similarly arranged structures in the hind limb, but they are not so liable to sprain as those in the fore limb because the weight of the rider on the back, which largely determines sprain in the fore parts, has little or no incidence on the hind limbs. While the

lamenesses produced have many characters in common, it is nevertheless desirable for the sake of accuracy in diagnosis that their causes and symptoms should be treated separately. The treatment required for each is practically the same and will be given after the following descriptions.

Sprain of the Inferior Check Ligament.

This ligament is situated at the upper end of the posterior aspect of the cannon bone, lying in the depression between the two splint bones. It is strongly inserted to the lower row of knee bones, from which it passes down and becomes attached, at about the middle of the cannon bone, to the tendon of the principal muscle flexing the foot (*flexor pedis perforans*). It has a function analogous to that of the superior check ligament, in that it checks over-strain of the tendon to which it is attached. Sprain of this ligament is most commonly met with in cart horses, although it also occurs in other horses as a result of some sudden jerk or strain, as when getting up in the stable or when galloping over "crab-holey" country.

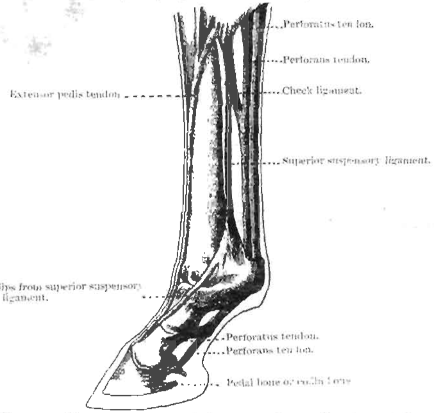


Fig. 4.—Diagram of bones, tendons, and ligaments of near fore leg. (After Hayes.)

SYMPTOMS.—Local pain, heat and swelling are usually quickly developed and if the swelling is at all pronounced it mechanically interferes with the bending of the knee, the action of which is consequently "stiff." The sprain most often occurs at the junction of the ligament with the tendon, *i.e.*, a little above half-way between the knee and the fetlock, and the enlargement is therefore more pronounced at this spot. When standing the knee and fetlock are slightly bent, the pastern is upright and the heel a little raised. This posture is assumed in order to lessen the tension on the sprained ligament. When moved there is an obvious want of free flexion of the knee accompanied by a stumbling gait with a tendency to stab the toe into the ground and to bend over at the fetlock.

Sprain of the Flexor Tendons.

Sprain of the perforatus tendon occurs in horses "tied in" below the knee and is often spoken of as sprain of the sheath of the tendon. Such a description is only admissible if the perforatus tendon is regarded in the light of a sheath through which the perforans passes. The perforans tendon is the strong, round, corded tendon which runs down posteriorly immediately underneath the skin, and it is this tendon which is most commonly sprained; especially in horses with long, oblique pasterns, in which by increase of leverage the strain on the tendon is correspondingly greater than in a straight pasterned horse. The seat of the sprain is usually slightly above the fetlock as the tendon passes over the sesamoid groove at the back of the fetlock. A sprain in this situation, when "calloused," produces the familiar "bowed tendons" of the race-horse, the steeple-chaser and the hunter. In these animals it is caused by the sudden strain put upon the tendons when they are extended in the gallop, carrying heavy weights, or when landing over fences. In the latter case at the

Fig. 5.—Sprained back tendons. (After Hayes.)

Fig. 6.—Sound back tendons. (After Hayes.)

Fig. 7.—"Bowed tendons." (After Hayes.)

moment of contact of the fore feet with the ground the whole weight of both horse and rider is momentarily thrown on the structures at the back of the fetlock.

SYMPTOMS.—The physical symptoms—heat and swelling—will be obvious in a short time after the sprain is sustained. The attitude when standing and the action during movement closely resemble those presented in the lameness last described—sprain of the inferior check ligament. (See Figs. 5 and 7.)

Sprain of the Suspensory Ligament.

This ligament (more definitely described as the "superior suspensory" or "superior sesamoidean" ligament) is a strong band of fibrous tissue lying in the groove between the two splint bones in contact with the posterior surface of the cannon bone and extending from the knee to the fetlock. It is attached above to the lower row of knee bones and below it bifurcates and becomes attached to the two small bones at the back of the fetlock joint—the sesamoid bones. These branches are continued as

fibrous slips which wind round to the front of the pastern bone and unite with the tendon of the *extensor pedis* muscle forming what is known as the *broad ligament*, which expands over the front of the short pastern bone subjacent to the junction of the hoof with the skin. The suspensory ligament acts as a pliable stay to keep the pastern bones and fetlock joint in position and to prevent the latter from being borne down to the ground

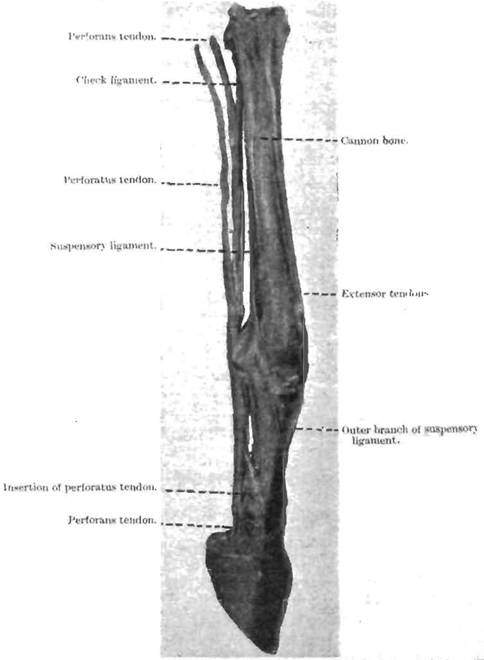


Fig. 8.—Side view of bones, tendons, and ligaments of off fore leg. (After Hayes.)

when unduè weight is thrown upon the limb. It is that portion of the ligament between the knee and fetlock which is usually sprained—most often one of the forked branches just above the fetlock joint; and it is in the gallop, particularly towards the end of a tiring race, that the sprain occurs. This is because during the gallop the leading fore leg has, at one part of each stride, to bear the full weight of the body; and the strain

on the suspensory ligament at such moments is tremendous; especially, if, when the horse is fatigued, the muscles are too tired to assist in supporting the weight or relieving the tension on the ligament.

Symptoms.—On the occurrence of a slight sprain there may be no lameness evidenced in the walk and the horse may stand level and bear weight on the limb; but in the trot, lameness will be at once apparent and the more severe the sprain the greater will be the lameness. Its principal characteristic is that the toe is always brought first to the ground and the fetlock is never allowed to go back to its natural position. When at rest the pastern is more upright than its fellow and the fetlock is held loosely

Fig. 9.—Sesamoidean and digital ligaments—posterior aspect; *a*, superior suspensory ligament; *b b b*, external and middle inferior sesamoidean ligaments. The central bundle is the *Y*, the two lateral ones forming the *V* ligament; *c*, annular sesamoidean ligament; *d d*, posterior ligaments of the pastern joint; *e e*, lateral; and *f*, inferior, navicular ligaments.

Fig. 10.—Deep sesamoidean ligaments; *a*, inter-sesamoidean ligament; *b*, crucial or *X* ligament.

Fig. 11.—Reversion to original type.

forward so that no strain is placed upon it at the back. If the ligament is actually ruptured, which however seldom occurs, the fetlock pad may descend almost to the ground. There will always be some local heat and swelling and pain on pressure of the sprained part, and the amount of these will be proportionate to the severity of the sprain. In old standing cases the ligament becomes thickened and corded to an extent plainly evident to touch and sight.

Treatment.—In the treatment of the conditions just described, as in fact of all sprains, complete rest is essential; in the first stages at all

events. Sloppy food should be given with an occasional dose of laxative medicine if the bowels become costive. Sluggishness of the bowels in such cases is best relieved by the giving of three or four ounce doses of Epsom salts mixed with the food once or twice a day as long as necessary. Purgatives of the aloes type are apt to be erratic and dangerous in Australia.

If the pain is great, hot fomentations as advised for shoulder sprain should be applied; if not painful, cold hosing as previously described is to be recommended, on account of its cooling and tonic effect. Between fomenting or hosing, whichever is resorted to, continuous pressure by means of bandages should be applied. In order that the bandages may not chafe, and also that the pressure may be evenly distributed, a roll of cotton wool should be first applied, and then a cotton or "stocking" bandage wound round somewhat loosely. On the top of this apply a second bandage pulled tight. The underneath bandage will prevent the top bandage from

Fig. 12.—Cotton wadding placed loosely round a fore leg. (After Hayes.)

Fig. 13.—Cotton wadding applied tightly to a fore leg by means of bandages. (After Hayes.)

chafing or otherwise causing injury no matter how tightly adjusted. The object of this bandaging is threefold :—(*a*) to prevent exudation of lymph which causes swelling; (*b*) to promote absorption of lymph already exuded; and (*c*) to give support to the torn or sprained fibres of the ligament, so as to give them rest and thereby facilitate their repair. The bandage need only be removed every second day unless there is evident discomfort, which should not occur if it has been properly adjusted. On removal of the bandage the parts should be smartly hand-rubbed and the joints flexed or "suppled" for half-an-hour or so, after which the bandage may be re-adjusted as before. (See Figs. 12 and 13.)

After about a fortnight of this treatment it may be necessary to apply a blister, and in some cases of severe sprain firing may require to be resorted to. Line firing of the "herring-bone" pattern suits best in this situation, and it is very effective in case of chronic or persistently recurring sprain.

Cessation of work or a spell at grass is of great advantage in the treatment, allowing, as it does, of time during which the injured parts may become strengthened to the normal point. It is found that the tendency to recurrence is greatly lessened if complete recovery is made before the horse is put to work again, and to insure this a rest from strenuous work for three or four months at least is often necessary.

SPLINT LAMENESS.

Splint may be defined as a bony deposit (*exostosis*) situated generally *on the inner aspect of the fore cannon (large metacarpal) bone and uniting*

Fig. 14.—External view of bones of fore limb. 1. Lower end of radius; 2. rooves for extensor tendons; Knee bones (3. Scaphoid; 4. Lunar; 5. Cuneiform; . Trapezium; 7. Magnum; 8. Unciform); 9. Large metacarpal or cannon bone: o. External small metacarpal (splint bone); 11. Sesamoid bones; 12. Long pastern one (or suffraginis); 13. Short pastern bone (or corona); 14. Navicular bone; 15. offin bone (os pedis); 16. Wing of os pedis. (After Strangways.)

hat bone with the inner splint bone (small metacarpal). Splints occur or the most part in light horses betwen the age of three and five years or

when just put to work on hard ground. The existence of hereditary influence is an often-noticed and undisputed factor in the occurrence of splints. Whether accompanied by lameness or not the presence of splints constitutes a technical unsoundness; although, in a matured horse, if they are not causing lameness and are so situated as not to be liable to interfere with the action of tendons, the horse may be passed as actually sound.

Development of Splints.—Professor Williams' teaching was that a splint is an hypertrophy or excessive growth of bone, at the particular part where it occurs, promoted by the nature of the work performed to so strengthen the part as to enable it to withstand the concussive shock incidental to work on hard ground. In this way he explained the formation of large splints without the occurrence of lameness. He also held that lameness only occurs when the bone forming activity is exaggerated into an actual inflammation of the bone or its covering (ostitis or peri-ostitis) or when, after the splint has formed and the two bones are strengthened by union, the bony enlargement is so situated as to interfere with the movement of the flexor tendons or to press upon the nerve of the part.

In view of a complete capitulation to Darwin's theory of evolution, which the author confesses to, he is inclined to go further than Williams, and to say that splint formation is a perfectly natural process—as natural under the conditions of horse life usually existing at the age period of splints as is the ordinary development and hardening of bone, the development and strengthening of muscle by work and training, or the growth of coat on the approach of winter. In each of these latter cases the changes occur as the result of surrounding circumstances which gradually induce their requirement. Bones harden as they are called upon to withstand shock and strain; muscles strengthen as the work required of them increases; the coat grows as the necessity for protection from the weather arises; and, pursuing the same line of reasoning, splints are formed in response to the demand for that greater strength of the bones immediately below the knee which is required to withstand the concussive shock associated with present day conditions of horse-work.

In support of this view that the formation of splints is largely an evolution process, consideration of such facts as the following may be invited.

The pre-historic horse, which existed at a time when the earth's crust had not emerged from a condition of bogginess was, so far as can be ascertained, a five-toed animal belonging to the species of which the tapir and the rhinoceros are present-day representatives. As the surface of the earth hardened, and the necessity for the expanding five-toed foot decreased, the evolution or metamorphosis into the soliped horse of our time can be traced by means of fossil remains through the *Eohippus* (Hipparion) which had four toes and the *Mesohippus* which had three toes. It is by no means unusual for horses to be born now-a-days which, by the possession of one or more supernumerary digits, manifest a reversion to one or other of these original ancestors. (*Fig.* 11.) The fusion of the digits has been taking place gradually throughout thousands of generations until now there remains but one complete digit, comprising a large metacarpal or cannon bone (*os metacarpi magnus*) articulating at the fetlock joint with the long pastern bone, and two small metacarpal or splint bones (*ossa metacarpi parvi*) one situated on the outer and the other on the inner aspect of the large bone posteriorly. These small bones do not extend downwards as far as the fetlock. They are the remains of previously existing outer and inner complete digits.

At birth and until the age of three or four years the two splint bones are attached to each other by the fibrous tissue constituting the interosseous ligaments; but at about four years, or earlier if the horse's work has involved inordinate concussion, homologous union between the bones commences. This may be signalized by an obvious enlargement or outgrowth of bone—yclept a splint—or by lameness, but it occurs in all horses and is a progressive process, so that by the time the horse is "aged" the bony union is complete throughout the whole length of the bones. A visit to a knacker's yard would quickly satisfy any sceptic that the three metacarpal bones in most horses over seven or eight years are completely united. It would hence appear that the union between the large and small metacarpal bones, by means of "splints," is merely evidence that their natural fusion into one solid bone, able to withstand the concussive strain that modern horse-work involves, is gradually taking place under our very eyes so to speak. The age period of splints is gradually lessening, for we learn from writers on veterinary subjects in the early part of last century that the age period in those days was from five to six years instead of from three to five, or even earlier, as it is now. There seems therefore to be justification for the assumption that, if the experience of the last hundred years is continued, it may not be many centuries before horses will be born with the three metacarpal bones fused into one bone, as they are now in later years.

CAUSES.—The immediate cause exciting to splint formation is the concussive strain put upon the fibrous connexion between the bones by the incessant banging of the ground during action, whereby an inflammation of this connecting tissue and of the fibrous covering of the bone (*periosteum*) is induced. Inflammations of this character involving the periosteum always result, in horses, in a deposition of bony matter in the swelling; and, according as the inflammation is severe or mild, the lameness, and the size of the bony enlargement, will vary in degree. Splints mostly occur on the inside of the cannon bone because the strain is greatest on the inner splint bone, on account of it being more directly under the centre of gravity and consequently having to sustain a greater weight-shock than the outer bone. Similarly it is because the hind limbs are not called upon to bear so much weight as the fore limbs that splints on the hind cannons are rare. Another reason for the more frequent incidence of splints on the inside is that the trapezoid bone of the knee rests wholly upon the head of the inner splint bone and consequently the strain of concussive shock on this bone has to be wholly borne by the interosseous fibrous tissue uniting it with the cannon bone; whereas on the outside the corresponding knee bone (the unciform) rests partly on the head of the cannon bone as well as on the splint bone, so that the weight-shock, being borne by both bones, will not cause such a severe strain on the interosseous tissue between the external splint and cannon bones.

From what has been said it will be obvious that horses with high action which bang the ground heavily are prone to splints, as are also young soft-boned horses when first used on hard roads or tracks.

There are five **Varieties of Splints** described:—

1. SIMPLE SPLINT situated from 1½ to 2 inches below the knee where it does not interfere with the action of the knee-joint or the movement of the flexor tendons or the suspensory ligament. In most cases only trifling lameness, if any, is caused by this class of splint and as it does not detract

from the usefulness of the horse it is classed as a blemish rather than an unsoundness.

2. PEGGED SPLINT in which the inflammation and accompanying bony enlargement extend peg-like in between the large and small metacarpal bones and through to the space at the back which lodges the suspensory ligament. The latter structure is interfered with by the enlargement and roughening of the bone, and the pronounced lameness which is associated with this condition is frequently prolonged and difficult to cure.

CANNON AND SPLINT BONES—NORMAL AND SPLINT-AFFECTED.

Fig. 15.—Off fore free from splint.

Fig. 16.—Near fore free from splints.

Fig. 17.—Splint on outside of off hind.

Fig. 18.—Splint on outside of off fore.

Fig. 19.—Aggravated splint formation.

Fig. 20.—Union of bones—aged horse.

3. CHAIN SPLINT which consists of a series of nodules running down the junction between the large and small metacarpal ones. On account of the comparatively large surface of bone and periosteum which is involved in this class of splint the lameness is often severe, and the splint bone becomes thickened throughout its entire length, so forming a *point d'appui* against which the foot of the opposite limb is apt to strike.

4. INTERFERING SPLINT occurs when the inflammatory process extends backwards and involves the free rim of the splint bone. The bony deposit resulting is often sharp and inclined to curve backwards so interfering with the action of the flexor tendons and causing marked lameness.

5. Knee Splint.—In this case the bone inflammation (*ostitis*) involves the head of the splint bone and the most internal of the lower row of knee bones—the trapezoid. On account of interference with the free movement of the knee joint the lameness is often inveterate and the bony deposit may extend in such a way as to involve the whole joint and cause "stiff knee."

Detection of Splint Lameness.—It has been indicated above that a large splint may form without any lameness. Conversely lameness may be exhibited without the appearance of any enlargement; and further, the degree of lameness in no wise depends on the size of the enlargement. It does however in a measure depend on the degree of severity of active inflammation; so that the presence of local heat and tenderness greatly assists to a conclusion even when there is no visible enlargement. In some cases considerable soft swelling may be felt in the earlier stages; and in acute

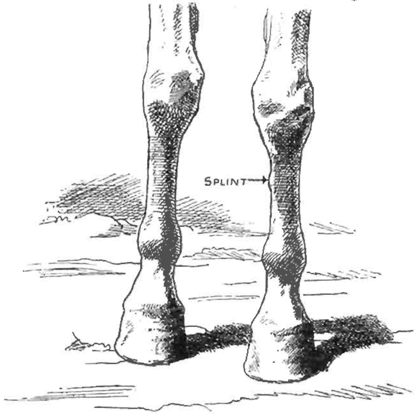


Fig. 21.—Splint on the inside of near fore leg. (After Hayes.)

cases, threatening abscess, the lameness is extreme. The age of the subject is also an aid to the diagnosis of splint lameness, which form of lameness can usually be eliminated if the horse is over six years old or even five.

The characteristics of splint lameness, which are usually sufficiently marked to give little room for error, are:—

- (*a*) The lameness in the trot is always excessive compared with that in the walk.
- (*b*) The horse may walk sound, or even trot so, on soft ground but is extremely lame when trotted on a hard surface.
- (*c*) The lameness always increases with exercise.
- (*d*) The "nodding," or dropping of the head when the foot on the sound side comes to the ground is more marked in splint lameness than in any other.

In the case of simple splint the lameness is only present during its formation and while the inflammation is active. After the splint has "set" there is no lameness even though the enlargement is considerable; the splint has by that time become part and parcel of the natural bone. When, however, a splint is so situated as to interfere with the action of a joint, tendon or ligament, or when, from any cause such as external violence, the inflammation is kept up, the lameness may remain for an inordinate length of time.

TREATMENT.—Rest is an essential feature in the treatment of splints. Without it the cause of the inflammatory action is continued, and efforts towards its subsidence will be futile. Even after lameness has disappeared it is inadvisable to risk a recurrence of the trouble by giving the horse work on hard roads, and if a spell at grass can be allowed it is often the wisest course to insure the continuance of soundness.

During the acute stages of splint formation, if the local pain and swelling are intense, febrile symptoms may be avoided by the giving of sloppy food and keeping the bowels open with an occasional dose of laxative medicine (two to four ounces of Epsom salts in a bran mash).

Splints that are not causing lameness and those which have "set" (*i.e.*, those in which the inflammation and loose swelling have disappeared and the bony growth hardened) should not be interfered with. While it is possible that the application of a bone absorbent blister *may* reduce the enlargement and so moderate the unsightliness, it more often happens that such applications re-kindle the inflammation and produce an extension of the mischief. Besides to produce any appreciable absorption of the bony enlargement such blisters require to be severely applied and the chances are that a permanent scar will result and be a much more unsightly blemish than the original splint. These observations apply also to the heroic measures frequently recommended by the "bush vet.," such as the insertion of setons, local bleeding, lancing, and firing.

On the other hand, the view cannot be subscribed to that in all cases treatment of splints is useless. It is held by some that in splint formation a definite inflammatory course is run and that the lameness will disappear only when the inflammatory action ceases. This is quite likely true, but there is no reason why the termination of the inflammation may not be hastened. By hand-rubbing or thumb-friction at half-day intervals, or by the application of a blister, there is caused a determination of blood to the part by which the functional energy of the bone-forming cells is stimulated and the process of repair or "setting" of the splint is expedited. In other words a short, sharp inflammatory action is induced in place of a slow, cold inflammation; and the object to be obtained, viz., the union of the two bones, is effected more quickly and with the formation of less surrounding swelling and less bony enlargement.

The best blister for splints is the red mercury ointment (one part of biniodide of mercury to eight of lard or vaseline) because in addition to its blistering effect it has also an absorbent action, and so while hastening the setting of the splint it tends to the reduction of the bony growth. It should be applied with smart thumb-friction directly over the seat of the splint at intervals of from three days to a week according as the blister-scale forms slowly or quickly. The intervals may be lengthened if excessive soreness is produced. A strong solution of corrosive sublimate has also a specific reducing effect on bony growths, but its effect on the skin is so severe and the likelihood of its application resulting in blemish so great

that, except in the hands of an experienced practitioner, its use cannot be recommended.

Firing is sometimes resorted to in the case of splints proving obdurate to milder treatment. Line firing produces a greater blemish than puncture-firing and it has no advantage over the latter. When the splint is well defined a single puncture deep through the skin and bone-covering membrane (*periosteum*) will suffice to induce curative action, but in the case of a diffuse enlargement or chain splint, three or more punctures, one above the other, may be made.

PERIOSTEOTOMY is an operation sometimes performed for the relief of pain in obstinate cases of splint lameness, and it also induces a curative action. It consists in cutting down through the skin and periosteum (the fibrous covering membrane of bone) deeply into the bony growth. The effect is the relief of pressure on the over-stretched membrane, which is profusely supplied with sensory nerve filaments, and a consequent easing of pain. The local bleeding which accompanies the operation also tends to the same end. This operation is sometimes extended to embrace the removal of the excess of bone growth. To do this it is necessary to dissect between the periosteum and bone for a sufficient area to allow of the introduction of a gouge or chisel whereby, with the aid of a mallet, the enlargement is chipped off level. After bleeding has ceased the edges of the periosteum are stitched together with a-septic catgut or kangaroo tendon and afterwards the skin is also stitched. In the performance of these operations it is advisable to either have the horse under chloroform or to produce local anæsthesia by the injection of cocaine solution (10 drops of a 5 per cent. solution of hydrochlorate of cocaine will suffice) and even then, with the animal perfectly still, a correct knowledge of the anatomy of the parts is essential to a successful result. The operation is facilitated if the part is rendered bloodless and this may be fairly well accomplished by first of all applying a bandage upwards from the foot to above the knee to squeeze upwards the venous blood in the veins and then to suspend the arterial flow by applying pressure to the radial artery above the knee by means of a pad and tourniquet (*see* p. 69). Adrenaline, the use of which is explained on page 60, may also be injected to prevent oozing of blood. During the operation, particularly the major one, the strictest antiseptic precautions are necessary to insure the satisfactory healing of the bone surface and skin wound. Antiseptic powder (iodoform one part, zinc oxide eight parts) should be applied to the stitched wound by means of a pad of cotton wool held in position by a bandage for a few days after the operation.

(*To be continued.*)

STOCK INSPECTION METHODS IN NEW ZEALAND.

Report on the Work of the Veterinary Branch.

W. J. Colebatch, B.Sc. (Agr.), M.R.C.V.S.

Prior to the enactment of *The Slaughtering and Inspection Act* 1900, the veterinary division of the New Zealand Department of Agriculture had to depend for its efficiency upon a total staff of from four to eight officers, and of this number three only were qualified veterinarians. In 1901, however, fifteen members of the Royal College of Veterinary Surgeons were appointed from Great Britain, and, in addition, five local veterinarians (qualified) were induced to join the division. The purpose of this reorganization of the Department was to provide for strict inspection of all methods and practices in vogue at public and private abattoirs and meat works. It is abundantly proved that as far as this function is concerned the efforts of the inspectorial staff have been signally successful. Further, in connexion with stock and dairy inspection, and particularly in actual field-work amongst the farmers themselves, the Government veterinary officers have so far proved their worth to the Colony as to win the encomiums of the public and the press. These facts are cited to show that the introduction of trained men into the Colony has resulted not only in accomplishing the specific purposes in view, but also in rousing the farmers and pastoralists to a keen sense of their responsibilities in regard to the care and treatment of all classes of live stock.

In New Zealand, as in all young Colonies, the natural spirit of self-reliance that arose from sheer force of circumstances, and formed so essential a characteristic of the successful pioneer, gave birth to an unreasonable sense of antipathy towards scientific measures and their exponents. To break down this misguided opposition, and thereby to pave the way towards the harmonious co-operation of farmers and veterinarians in the eradication and prevention of stock ailments, has been the arduous yet pleasing duty of these officers. The advantages which have already accrued from this source, namely, the education of the farmer to a knowledge of his requirements, have in themselves more than justified the expenses incurred through the expansion of the veterinary staff.

In his last report to the Secretary for Agriculture, Mr. J. A. Gilruth, M.R.C.V.S., Chief Veterinarian, states that the total expenditure for the year 1905-06 was £16,400, and of this sum nearly £8,200 was recovered in the form of meat-inspection fees. It seems, then, that the total cost to the country of this division of the Department of Agriculure is just about £8,000 per annum. When consideration is given to the diagnostic and investigational work carried out at the Wallaceville Laboratory, the protection afforded the public by inspection of abattoirs, dairies, and milch cattle, the educational work conducted by the staff from Auckland to the Bluff, and, finally, the enormous benefits conferred on the dairy farmer and cattle grazier by the preparation, distribution, and application of Black-leg vaccine, it is clear that this amount is in no sense proportionate to the advantages derived from its expenditure.

The following particulars regarding the staff as now constituted are taken from the Chief Veterinarian's latest statement:—

Veterinary surgeons—		
At head-quarters	2	
On field-work	5	
Inspectorial work	19	
	—	26
Meat and dairy inspectors		10
Assistant inspectors		19
Clerical and laboratory staff		7
		—
		62
		—

The main functions of the Department may be briefly stated as under:—

1. The inspection of public and private ABATTOIRS and of meat export factories. The Department also urges the erection of public slaughter-houses on conservative councils, and controls the management and sanitation of them. Stock inspectors attend sale yards, farms and factory yards for the purpose of culling all animals affected with a notifiable disease. In the majority of the meat works and abattoirs a further ante-mortem examination is carried out by the trained meat inspectors and their assistants immediately prior to slaughter. The slaughtering and exenterating operations are, as far as possible, performed under supervision, to provide against the possibility of substituting healthy for diseased viscera.

In many of the smaller factories special equipment is supplied to meet the difficulty; by this means the carcass and the viscera are placed either side by side, directly opposite or in some other constant relationship till the final inspection has been made. Any attempt to mislead by referring entrails to carcasses with which they have no connexion is met with a heavy penalty.

After being washed with clean water each animal is closely inspected in the following manner:—

(*a*) Facing the abdomen, the inspector passes his hands over the thighs, stifles, flanks, inspects the inguinal area, opens the slit abdominal wall and rapidly glances at the condition of the pelvis, loins, kidneys and kidney fat, peritoneum, diaphragm or "skirting," and the pleura or chest lining. Next he runs his hands down over the elbows and in front of the shoulder joint. In this way he includes the chief lymphatic glands of the body, viz., pophliteals, precrurals, inguinals, lumbars, thoracic, prepectorals and prescapulars, in his system of inspection. The cervical or neck region completes this part of the work.

(*b*) Facing the back, the inspector passes his hands from tail to neck to test the condition and at the same time to satisfy himself as to the absence of bruises, deep-seated abscesses, discolorations, and as to the general quality of the meat.

(*c*) The inspection of the viscera is very carefully performed in the case of suspected or diseased carcasses, and in a more cursory fashion in all other cases. Removal of viscera to avoid inspection is rewarded by rejection of the whole carcass. Each carcass as rejected is branded and set aside for more detailed examination later on. It is then either wholly condemned or else the diseased parts are separated and the remainder "passed."

2. The investigation and diagnosis of OUTBREAKS OF DISEASE, as well as the instituting of preventive and suppressive measures in the case of epi- and enzootics.

3. Experimental RESEARCH is also conducted as opportunity offers.

4. FIELD-WORK.—A proportion of the staff is distributed throughout the chief agricultural districts in order to carry out prophylactic measures in regard to black-leg, tuberculin inoculations, to demonstrate the Departmental methods of dealing with contagious abortion, milk fever, and contagious mammitis, and to keep a sharp look out for any disease—sporadic or infective—which is likely to require consideration at head-quarters. These are the officers that, by skilful and scientific methods at the steading or in the paddock, have brought home to the farmers the value of rational remedies.

5. LECTURING.—This branch of the work has been given a prominent position in the official programme, but though prosecuted with unwearying diligence, the results have not been wholly satisfactory. The opinion of Mr. Gilruth is not in favour of free lectures; he finds from experience that better attendances are insured if a small fee—say, 5s. for the course—be levied. However, it should be noted that no examinations were held in connexion with the New Zealand classes, nor were any certificates or other form of inducement offered, as is the case in Victoria. Probably, also, the extraordinary prosperity of the country has, to a certain extent, diverted the attention of the farming community from the manifold advantages to be gained from veterinary instruction. It is only fair to add that some excellent veterinarians are naturally unfitted for this particular class of work. Personally speaking, I am strongly of opinion that no great good can be accomplished by any lecturer who does not take occasion to demonstrate clearly and forcibly in the field that his scientific utterances are worthy of every attention from the practical farmer. He must come out from behind the lecturing desk, and actually perform the work which he has prescribed and explained. Having gained the respect and confidence of his audience in this way—and he can do so by no other means—his explanations and words of advice will be received with gratitude and credence. Where this idea can be adopted I am convinced that neither class fees nor examinations are essential to success.

6. INSPECTION OF DAIRIES.—This has only been spasmodically performed, owing to the lack of available officers. On several occasions efforts have been exerted to place this important work on a satisfactory basis, but so far without avail. Compulsory registration and routine inspection are still amongst the ambitions of the Department, so that Victoria has nothing to learn, at present, from New Zealand as far as veterinary inspection of dairies and dairy farms is concerned. In a few instances, the inspectors at abattoirs act as local dairy inspectors, but there is no general scheme yet in vogue for the whole Colony.

A consideration of the system of dairy supervision that obtains in Victoria brings up the question of the relative advantages and disadvantages of establishing a numerically strong qualified staff of veterinarians by Colonial Governments. Under some conditions, this has proved a most unwise procedure; but in New Zealand, thanks to the enormous development of the frozen meat trade, the circumstances are exceptionally favourable. With an industry of this nature, careful inspection by trained men was an absolute *sine quâ non*—in fact, the companies would in any case have imported their own inspectors to secure the confidence of the public. The opportunity, therefore, of establishing and maintaining a powerful

Veterinary Department was almost without a parallel in the history of the British Colonies, and New Zealand was peculiarly fortunate in having a man with Mr. Gilruth's perspicacity and force of character to grasp the situation and initiate the movement. Were the whole burden of such a staff to be borne by the ordinary taxpayer, it is not difficult to see that such a system is apt to break down, and it would be courting failure to attempt to run a similar department unless some means of defraying the cost is devised. Why New Zealand should be exporting 1,750,000 cwt. of mutton per annum, and the whole Australian Commonwealth only 600,000 cwt., is by no means so clear, more especially as the Australian lamb and mutton—to a very large extent grass-fed—are on the London market 6—8 weeks earlier, and, moreover, the New Zealand sheep are almost invariably fattened, or at least "topped off," on such expensive forage crops as rape, kale, turnips, and mustard. Perhaps when the Australian farmers are more alert to the importance of the sheep-raising industry the freezing trade will expand as it has done across the water, and therein may arise an emphatic demand for the appointment of a numerically strong staff of veterinary officers.

It is interesting to record the fact that the New Zealand Government has so far recognised the necessity of keeping in close touch with scientific progress in Europe as to grant, at intervals, to the chief of the division sufficient leave of absence to enable him to visit the chief British and Continental laboratories, and to keep in personal contact with the leading savants of the Old World.

THE PROCLAIMED PLANTS OF VICTORIA.

(Continued from page 230.)

Alfred J. Ewart, D.Sc., Ph.D., F.L.S., Government Botanist; and J. R. Tovey, Herbarium Assistant.

The Furze.

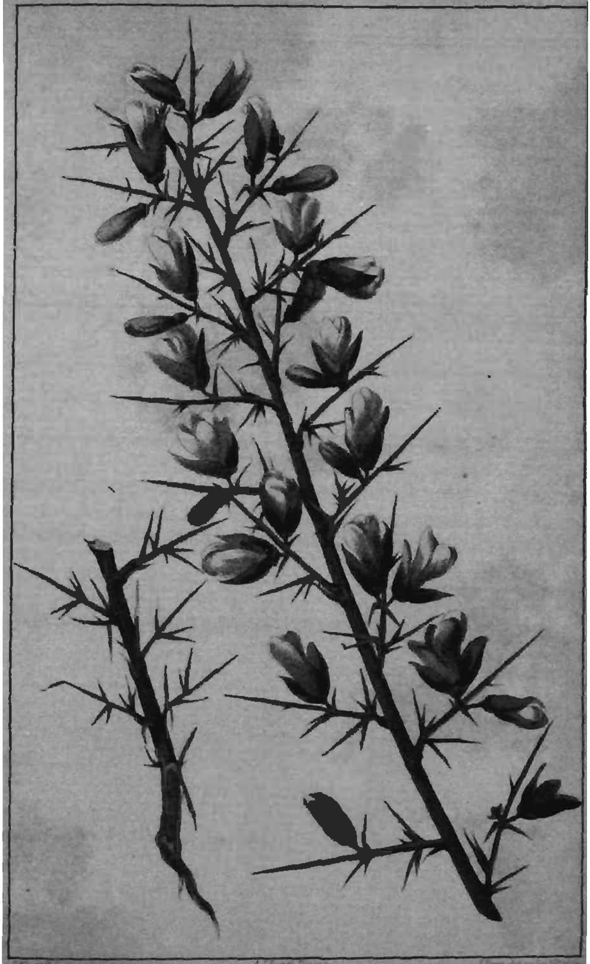
Ulex Europæus, Linné. (*Leguminosæ.*)

A shrub of 2 to 3 feet, or even twice that height when old and luxuriant, more or less hairy, especially on the main branches; the numerous short, intricate, small branches all ending in a stout thorn. Lower leaves occasionally lance-shaped, but the greater number reduced to thorns, up to a centimetre in length or more. Flowers fairly large, solitary, in the axils of the leaves on the preceding year's shoots, forming showy racemes, intermixed with thorns at the end of the branches. Calyx yellow like the petals and but little shorter, clothed with brownish hairs, with a small, broad bract a millimetre or two in length on each side at the base, besides a similar bract under the short pedicel. Petals narrow.

An introduction from Europe. In Western France, its branches are crushed for fodder, and when chopped are used as kindling wood. Cows will browse on the young shoots. This perennial hedge-plant, owing to its strong growth, is hard to eradicate, especially on sandy soil, but is easily killed on land that can be flooded. If kept closely trimmed it flowers but little, does not spread, and forms a good hedge plant. A neglected hedge, however, soon becomes a permanent danger.

Proclaimed under the Thistle Act for various districts, comprising the greater part of the State.

PLATE 12



Artificial Manures Acts.

SUPPLEMENTARY LIST OF UNIT VALUES OF MANURES IN THE MELBOURNE MARKET DURING THE SEASON 1907.

Description of Manure.	Moisture.	Phosphoric Acid.								Estimated Total Value of Manure per ton.	Price asked for Manure per ton Delivered at Local Railway Station.	Where Obtainable.
		Water Soluble.		Citrate Soluble.		Insoluble.		Total.				
	Percentage.	Percentage.	Estimated Value in One ton of the Manure.	Percentage.	Estimated Value in One ton of the Manure.	Percentage.	Estimated Value in One ton of the Manure.	Percentage.	Estimated Value in One ton of the Manure.			
			£ s. d.		£ s. d.		£ s. d.		£ s. d.	£ s. d.	£ s. d.	
MAINLY PHOSPHORIC.												
Phosphoric Acid readily Soluble.												
Superphosphate	11.93	18.56	4 3 6	1.68	0 6 9	0.49	0 0 6	20.73	4 10 9	4 10 9	4 0 0	W. P. Shaw, The Olderfleet, Melbourne
Hasell's "Jap" Superphosphate	11.31	20.90	4 14 0	0.42	0 1 8	0.63	0 0 8	21.95	4 16 4	4 16 4	4 0 0	A. H. Hasell, Queen-street, Melbourne
Hasell's "Jap" Superphosphate	14.01	19.71	4 8 8	0.45	0 1 9	0.28	0 0 3	20.44	4 10 8	4 10 8	4 0 0	" " " "
Phosphoric Acid moderately Soluble.												
Thomas Phosphate	..	..	..	15.18	3 0 8	3.19	0 9 7	18.37	3 10 3	3 10 3	4 0 0	Welch, Perrin, and Co., Queen's Bridge-street, Melbourne
Thomas Phosphate	..	..	..	16.75	3 7 0	2.72	0 8 2	19.47	3 15 2	3 15 2	4 0 0	Messrs. Wischer and Co. Prop. Ld., Melbourne
Hasell's Thomas Phosphate ..	..	..	..	14.27	2 17 1	3.40	0 10 2	17.67	3 7 3	3 7 3	3 10 0	A. H. Hasell, Queen-street, Melbourne

SUPPLEMENTARY LIST OF UNIT VALUES OF MANURES IN THE MELBOURNE MARKET DURING THE SEASON 1907—*continued.*

Description of Manure.	Moisture.	Nitrogen.		Phosphoric Acid.		Mechanical Condition.						Estimated Value in one ton of the Manure.	Price asked for Manure per ton Delivered at the Local Railway Station.	Where Obtainable.
								Nitrogen.		Phosphoric Acid.				
	Per-cent-age.	Per-cent-age.	Estimated Value in One ton of the Manure.	Per-cent-age.	Estimated Value in One ton of the Manure.	Per-cent-age of Fine Bone.	Per-cent-age of Coarse Bone.	Per-cent-age in Fine Bone.	Per-cent-age in Coarse Bone.	Per-cent-age in Fine Bone.	Per-cent-age in Coarse Bone.			
			£ s. d.		£ s. d.							£ s. d.	£ s. d.	
CONTAINING PHOSPHORIC ACID AND NITROGEN.														
Phosphoric Acid Difficultly Soluble.														
Bonedust	5.15	3.22	1 12 1	14.55	2 8 3	31.40	68.60	1.01	2.21	4.57	9.98	4 0 4	4 0 0	John Adams, Doreen
No. 1 Bonedust, "Echuca Bone"	4.07	3.57	1 15 10	19.45	3 5 4	36.00	64.00	1.28	2.29	7.01	12.44	5 1 2	5 5 0	Boyle, Williams, and Henderson, Echuca
Bonedust	4.84	3.26	1 14 0	17.60	3 3 8	62.00	38.00	2.03	1.23	10.92	6.08	4 17 8	6 0 0	J. R. Sporn, Nhill

W. PERCY WILKINSON,
Government Analyst for Victoria, and Acting Chemist for Agriculture.

Government Laboratory,
Melbourne, 9th April, 1907.

Artificial Manures Acts.

LIST SHOWING RESULTS OF ANALYSES OF SAMPLES OF ARTIFICIAL MANURES COLLECTED IN THE STATE OF VICTORIA UNDER THE PROVISIONS OF THE ARTIFICIAL MANURES ACTS.

Label No.	Official No.	Description of Manure.	Manufacturer or Importer.	Moisture.	Nitrogen. Found.	Nitrogen. Guaranteed.	Phosphoric Acid. Water Soluble. Found.	Phosphoric Acid. Water Soluble. Guaranteed.	Phosphoric Acid. Citrate Soluble. Found.	Phosphoric Acid. Citrate Soluble. Guaranteed.	Phosphoric Acid. Insoluble. Found.	Phosphoric Acid. Insoluble. Guaranteed.	Phosphoric Acid. Total. Found.	Phosphoric Acid. Total. Guaranteed.	Average Net Weight Found.	Net Weight Guaranteed.	Estimated Value per ton.
				%	%	%	%	%	%	%	%	%	%	%	lbs.	lbs.	£ s. d.
46	18875	Blood Manure ..	Melbourne City Council ..	24.80	7.63	..	..	..	..	..	..	..	0.52	..	..*	..	4 5 6
25	18707	Florida Superphosphate ..	Messrs. Cuming, Smith, and Co. ..	13.96	..	..	17.93	19.00	1.35	1.00	2.31	1.5	21.59	21.5	..*	224	4 8 4
26	18708	" " ..	" " " " ..	13.31	..	..	18.30	19.00	1.20	1.00	2.30	1.5	21.80	21.5	..*	224	4 9 5
33	18818	" " ..	" " " " ..	10.32	..	..	19.39	19.00	0.69	1.00	2.18	1.5	22.26	21.5	227¼	224	4 12 2
35	18819	" " ..	" " " " ..	10.85	..	..	19.13	19.00	1.70	1.0[illegible]	1.36	1.5	22.19	21.5	228¼	224	4 14 3
54	18969	" " ..	" " " " ..	11.19	..	..	19.15	19.00	0.56	1.00	2.64	1.5	22.35	21.5	225¼	224	4 11 0
55	18990	" " ..	" " " " ..	11.67	..	..	19.32	19.00	0.38	1.00	2.37	1.5	22.07	21.5	225	224	4 10 10
27	18705	No. 1 Superphosphate ..	Mt. Lyell Mining and R. Coy. ..	11.74	..	..	19.58	19.00	0.70	1.00	2.20	1.0	22.48	21.0	..*	224	4 13 1
29	18709	" " ..	" " " " ..	10.39	..	..	19.47	19.00	0.75	1.00	2.39	1.0	22.61	21.0	..*	224	4 13 0
32	18839	" " ..	" " " " ..	10.47	..	..	19.50	19.00	0.76	1.00	1.47	1.0	21.73	21.0	226½	224	4 12 3
38	18840	" " ..	" " " " ..	11.11	..	..	19.39	19.00	0.74	1.00	1.49	1.0	21.63	21.0	..*	224	4 11 9
67	19030	" " ..	" " " " ..	10.25	..	..	19.14	19.00	1.41	1.00	1.32	1.0	21.87	21.0	224	224	4 13 0
28	18703	Superphosphate ..	Messrs. Wischer and Co. ..	9.44	..	..	19.80	19.00	0.55	1.00	1.29	1.0	21.64	21.0	..*	224	4 12 6
30	18710	" ..	" " " ..	8.16	..	..	19.53	19.00	0.65	1.00	1.32	1.0	21.50	21.0	..*	224	4 11 9
64	18967	" ..	" " " ..	7.83	..	..	17.94	19.00	0.79	1.00	1.52	1.0	20.25	21.0	223	224	4 5 4
81	13093	15% Superphosphate, Federal	Australian Explosives and Chemical Coy.	6.41	..	..	18.03	13.20	3.2[illegible]	0.20	0.74	1.1	16.97	14.5	211¼	224	3 12 1
58	18971	Superphosphate, Standard Flag Brand	Renard Fertilizing Coy. ..	7.51	..	..	16.31	17.00	3.41	1.50	0.89	0.5	20.61	19.00	217	224	4 7 10
44	18377	Thomas "Star" Phosphate and Superphosphate	Colonial Manures Coy. ..	7.65	..	..	5.55	..	10.51	..	1.86	..	17.92	19.00	228	224	3 12 7
63	18932	" " "	" " ..	4.85	..	..	5.74	..	11.73	..	0.87	..	18.34	19.00	223¼	224	3 15 4
66	18999	Thomas "Star" Phosphate	" " ..	..	..	..	..	..	18.62	..	1.28	..	19.90	18.00	228	224	3 18 4

* Consignments not weighed.

LIST SHOWING RESULTS OF ANALYSES OF SAMPLES OF ARTIFICIAL MANURES, ETC.—*continued.*

Label No.	Official No.	Description of Manure.	Manufacturer or Importer.	Moisture.	Nitrogen.		Phosphoric Acid.		Mechanical Condition.				Net Weight Found.	Net Weight Guaranteed.	Estimated Value per ton.
									Fine.		Coarse.				
					Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.			
				%	%	%	%	%	%	%	%	%	lbs.	lbs.	£ s. d.
48	18896	Kensington Bonedust ..	J. Kitchen and Sons	9.13	3.95	3.50	17.95	19.00	48.00	38	52.00	62	115¼	112	5 2 9

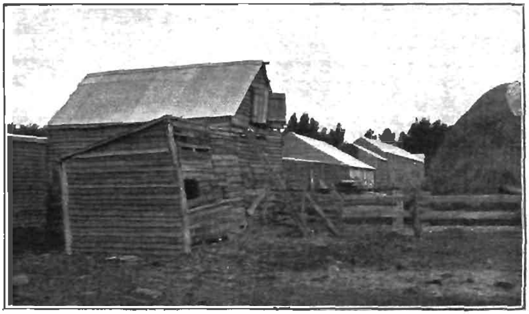
W. PERCY WILKINSON,
Government Analyst for Victoria,
and Acting Chemist for Agriculture.

Government Laboratory,
Melbourne, 9th April, 1907.

OLD AND NEW MILKING SHEDS.

E. G. Morris, Dairy Supervisor.

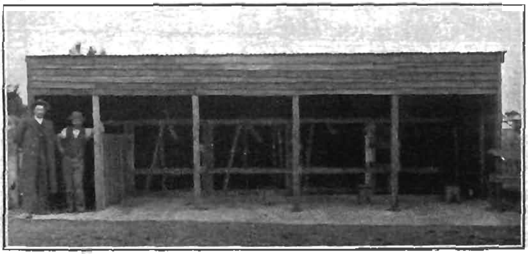
The accompanying illustrations represent the old and new milking sheds on the farm of Mr. B. W. Pung, Ballan, and show that the bare require-



DIRTY AND DILAPIDATED.

ments of the Milk and Dairy Supervision Act concerning milking sheds on small dairy farms may be effected at almost a nominal cost.

Little need be said regarding the old building; a glance at the photograph will suffice to show the state of things that existed generally. Not



SIMPLE AND SANITARY.

only is the state of the shed in evidence, but that of the yard also, which is low-lying and without even a natural drainage. But in and about the new building a different state of things exists. There is seen a neat,

comfortable shed, sheltering the milkers from the rough weather, and with a well drained, impervious floor—a shed that meets all the requirements of the dairy farmer in a small way, for milking purposes.

The cost of this shed was £9 10s. without labour, and there is scarcely need to employ outside labour to erect a simple building of this kind. The size is 26 ft. x 11 ft. The woodwork is all sawn timber, with the exception of the main bail posts, and these are of split timber 8 in. x 4 in. x 7 ft. long. The stall partitions are comprised of two lengths of 4 in. x 1½ in., the heel posts of 3 in. x 3 in., the bail "sticks" 3 in. x 2 in., and the "runners" along the top and bottom of the bails of 4 in. x 1½ in. (all hardwood). The walls are of 6 in. x ½ in. weatherboards nailed to studs 3 in. x 2 in. There are 4 stalls 5 ft. 6 in. wide, thus taking up 22 ft. of the 26 ft., and leaving a space of 4 ft., which is partitioned off from the stalls, and in which are placed the milk cans, the spring balance for weighing the milk, the milk records sheet and the necessary appliances for washing the hands after each cow is milked.

The floor, which is of concrete, has a fall of 1 in. from the bail to the drain, and is raised about 9 in. above the level of the yard. Over a foundation of large stones and rubble, "blinded" with sand, is placed a layer of concrete (1 in 6) 3 in. thick, and over that a 2 in. layer (1 in 3). There is a drain just behind the heel posts, which empties itself into a larger drain well away from the shed and yard.

CHEDDAR CHEESE IN GREAT BRITAIN.

Present Methods of Manufacture.

J. G. McMillan, N.D.D., Cheese Expert.

On arrival in England one of the first places visited was the British Dairy Institute at Reading, managed by Mr. Miles Benson, a leading dairy authority in England. At this institution the evening's milk is cooled down to 65 degrees Fahr. In the morning a quantity of pure culture starter is added, after the morning's milk is in. When the correct amount of acidity is developed and the temperature of the milk from 82 to 85 degrees Fahr. (depending on the season of the year, the atmospheric condition of the day, &c.), sufficient rennet is added to bring about a firm coagulation in 45 to 60 minutes. Usually about 4 ounces are required to each 100 gallons milk. When the curd is sufficiently firm it is cut fine with the American knives. Heating is begun about 40 minutes from the time cutting commences, taking about 45 minutes to raise the temperature to 97-102 degrees Fahr. (depending on the season of the year and quality of milk). The curd is allowed to be shotty and hard before being permitted to "pitch," when after fifteen minutes a rack is put over the curd and weighted with a 56-lb. weight for every 100 gallons milk. Thus the curd remains until it is consolidated or begins to mat. It is then cut up the

centre with a long knife, rolled to the upper end of the vat and the racks and weights placed on as before. When the curd shows about ⅛ to ¼ inch threads on a hot iron the whey is drawn off, weights removed, and the curd cut into small blocks and spread over the bottom of the vat, where it is reweighted and allowed to lie ten minutes. It is then placed on the curd sink and weighted again, opened and turned every twenty minutes. When the curd is firm and tough it is cut into 2-inch cubes, tied into a bundle like a plum pudding and weighted; opened out and separated every half-hour until ready to grind when it shows 1½-2 inch threads on the iron. It is claimed that this method of manufacture gives a more open and meaty cheese than that obtained by the Canadian system. A close investigation of the industry reveals the fact that the methods of manufacturing Cheddar cheese are as numerous as are the localities in which it is made. The various methods differ so much that it seems quite impossible that practically identical results can be obtained by such divergent means. Yet in all cases the result is Cheddar cheese. There is however this difference between the cheeses made on the various systems: Some will ripen more quickly than others made on another system, while a third system may produce a cheese taking still longer to ripen. Thus a rapidly ripening cheese will be ready for the market three months after it is made, others will take six months to ripen, while formerly it was the custom to keep a Cheddar cheese twelve months before it was considered ripe. Hence the extreme methods have become known as rapid and slow-ripening systems. In flavour there is not much variety due to the differences in the systems of make. The texture of a Cheddar cheese should be absolutely uniform and solid. Some methods tend to produce this result far more than others. Some systems tend to produce a bad cheese, others a soft and mellow product which is considered of importance as regards quality. The Candy, the Cannon, the Joseph Harding, and the Canadian systems, or modifications of them, are the principal methods practised throughout Britain.

THE CANDY SYSTEM.

The evening's milk is not allowed to become cold before coming into the dairy. It is then placed in deep vessels so that it will not fall below 68 degrees Fahr. by morning. If the milk has been properly kept and ripened overnight it is not considered advisable to further carry on this ripening where the two milkings are mixed together. The desired temperature for renneting is obtained by heating the morning's milk only and then mixing with that of the evening. The rennet is added at 84 degrees Fahr.—about one teaspoonful to 8 gallons of milk. The rennet is stirred in for about six minutes, the whole being allowed to rest and covered over to maintain the temperature. To facilitate testing whether the milk is sufficiently set or not a bowl is left floating upon the top of the milk, and when the curd is firm enough it will come away quite clean when the bowl is slightly raised on one side. If it does not the curd must be left until sufficiently firm, which should take about 45 minutes from the time of adding rennet. The top of the curd is now turned over by the use of the skimmer, the surface being cut to a depth of about 2 inches. The vat is covered over with a cloth and allowed to remain until the whey rises. This should not take more than about fifteen minutes. The breaking of the curd is done either with the American knives or by the old-fashioned breaker. The makers on this system like the curd when breaking

is completed to be in a very fine condition, angular and not rounded but in sharp-edged fragments. When this system is adopted round vats are mostly used, the whey being heated in boilers for the purpose of scalding. The curd is heated up to a temperature of about 160 degrees Fahr. It is then allowed to settle in the bottom of the vat until the whey is ready to draw, when it should be firmly matted together. When the whey is drawn the matted curd lying in the bottom of the vat is cut into foot squares, turned over and left for five minutes. Each square of curd is now cut into two pieces and taken to the cooler. If the acidity is low these slices are placed close together to keep in the heat, but if the acidity is developing rapidly they are not packed so closely. The curd is turned upon the cooler after 20 minutes, again after 30 minutes and once again before cutting. It is then cut into pieces about 3 inches square, packed closely and covered with a cloth. It is opened up and turned at the end of 30 minutes and again in 40 minutes when it should be ready for grinding. The curd is then milled and left for about two to two and a half hours when it is salted. The curd is vatted at 70 degrees Fahr.

THE CANNON SYSTEM.

In this a starter is used in the form of sour whey and rennet is added at a temperature of 84 degrees. Scalding is done in a similar manner but not to such a high temperature as in the Candy system. When the whey is drawn the curd is cut into blocks, about 6 to 8 inches square and piled in the bottom of the vat. It is covered over with a cloth and left to drain for about ten minutes when the amount of acidity present should be about 3 per cent. Half of the curd is then taken to the cooler, broken with the hands into small pieces and tied up tightly in a cloth; should an excess of acid be present the curd is not tied up immediately but allowed to lie about fifteen minutes before doing so. The remaining half is treated in a similar manner and the two bundles are then placed one on top of the other, well covered and subjected to pressure. It is left for half-an-hour, then taken out and cut with the knife into oblong pieces, mixed together, and again tied up in cloth; taken out again after half-an-hour, cut into small pieces and again subjected to pressure. This operation is carried on until the curd is ready to grind. It should then be dry and solid when cut through, leathery and flaky when torn asunder, of good taste and smell and sufficiently acid, showing about 8 per cent. acid in the whey. It has been mentioned that round vats are used but it does not follow that they are essential, in fact the rectangular vat is used in factories where the Cannon system is practised.

THE JOSEPH HARDING SYSTEM.

This is one of the oldest methods; home-made rennet is used principally and the milk is set at 80 degrees Fahr. An hour is allowed for coagulation, the curd when firm enough is broken on the top and allowed to settle for some time to allow the whey to rise, which is drawn off for the heating process. The curd is then broken into small pieces with shovel breakers. When completely broken as much of the heated whey as suffices to raise the mass to 80 degrees Fahr. is mixed in, bringing the mixture to the same temperature at which the rennet was added. Nothing more is done for an hour. A few buckets of whey are then removed, heated and poured into the mass. During the pouring in of the whey, the stirring

is actively continued in order to mix the whole regularly and not to allow any portion of the curd to be overheated. The temperature is raised to 100 degrees Fahr. and stirring continued until the curd is firm; left half-an-hour to subside and when settled at the bottom the whey is drawn off. The curd is then heaped in one end of the vat and left with no other pressure than its own weight. After this interval it is cut across in large slices, turned over and left in a heap for half-an-hour, the whey coming away freely. The curd should then be fit for pressure and its temperature should be about 60 degrees Fahr.; if not cool enough it is broken by hand and placed on a cooler as long as necessary. It is then placed in hoops and subjected to moderate pressure for half-an-hour; then taken from hoops, put through the curd mill and 1 lb. of salt added to every 56 lbs. curd. This system is not very often seen in use, the makers having gradually died out or adopted more of the Canadian style.

THE CANADIAN PROCESS.

This is now well known in Victoria and has been fully described in the *Journal of Agriculture*, so that it is quite unnecessary to give details. It is worthy of notice, however, that the process was first introduced into Scotland by Mr. R. J. Drummond, a Canadian who is now head of the Dairy School for Scotland. This method has now gradually gained ground, until it is generally recognised as head and shoulders above all other systems. The reason may be that as Canadian cheese is gradually taking the lead on the British market the British cheesemaker recognises that he must produce the best if he is to have sale for his produce at all. Many who were strong opponents of the method when first introduced are now among its leading exponents. Last year at the London Dairy Show the cheese made on this principle swept the prize list. There are of course some makers who do not carry out all the details as suggested by the introducer, but most do so at the principal stages. The cry was raised by certain merchants that Scotch cheese was deteriorating owing to the changes of system. The success of makers on the Canadian system at London and other leading shows tends to disprove the statement. Professor Drummond repudiates the statement and is of the opinion that the cry was raised to keep down the prices of cheese. It may be said that Professor Drummond would be prejudiced in favour of cheese made on the method practised by himself. Mr. James McAdam of Craigley, Castle Douglas, was asked his opinion on the matter. He expressed himself as follows:—"I reckon that years back there would be found superior outstanding lots, but the cheese made under the new method is far more uniform in quality. I also consider that the starter, when used judiciously, is a boon and a blessing to cheesemakers. I am further of opinion that the recent outcry about the deterioration was quite uncalled for."

The use (or abuse) of the starter made from pure cultures was blamed, and it was decided to conduct experiments as to the safest quantity of starter to use. A scheme was drawn up, and the experiments were conducted in Wigtownshire, Kirkcudbrightshire, and Ayrshire, as well as at the Kilmarnock Dairy School.

Experiment A.—Cheese to be made with the aid of a ripening agent prepared by the development of a pure culture in milk pasteurised at a temperature of 165 degrees Fahr. one-half per cent. starter to be used. Starter in every case to be procured from the Kilmarnock Dairy School.

Experiment B.—Identical with former except that only one-quarter per cent. of starter was to be used.

Experiment C.—The ripening agent to be a pure culture in whey which had been heated to a temperature of 165 degrees Fahr., one-half per cent. of this starter to be used.

Experiment D.—Identical with C, except that the quantity of starter to be used was one-quarter per cent.

Experiment E.—The cheese was to be made in the way ordinarily followed in the dairy, but the curd was to be drained in the vat.

Experiment F.—Identical with E, but the curd to be drained on the racks.

In addition to these experiments control cheese was to be made after the manner regularly followed. The object was to discover not only under what conditions and with what starter the best results were obtained, but also whether cheese was better quality when the curd was dried in the vat or on the rack. To find out how the cheese suited the trade they were tested from time to time by Messrs. A. Clement, sen., and Osborne, both large cheese factors in Glasgow, and their judgment of each was recorded at each visit. Mr. Clement considered that some of the cheeses made with starters at the beginning of the experimental period were better than those made at the end, one going back in taste and quality, the other going forward. On the whole the experiments are not considered very conclusive. *One thing however was made clear, namely, that all the lots of cheese were considerably better when the curd was dried on the rack than when dried in the vat.*

The scores were as follow:—

How Made.	Wigton. May, June, July.	Kircudbright. May, June, July.	Ayr. May, June, July.	Kilmarnock. May, June, July.
A. ½% P.C. in milk ...	90½, 90, 90	91½, 96, 94	82, 85, 91	95, 94, 92
B. ¼% ,, ,, ...	91, 91, 92½	91, 92, 88½	88½, 83, 90	96, 95, 97
C. ½% P.C. in whey ...	95, 90, 92½	91, 92, 90	88½, 85, 90	96, 94, 88
D. ¼% ,, ,, ...	93, 88, 92½	92½, 90, 88	89, 89, 82½	97, 87, 96
E. Curd drained in vat	90	91	...	93
F. Curd drained on rack	91½	92	...	95
Control Cheese.				
G. First date ...	93, 81, 88	92, 93, 91	79, 72, 90	97½, 94, 95½
H. Second date ...	92, 84, 85	93, 89, 92½	81, 87, 88	98½, 93, 91⅓

From the above table it appears as if one man produced the best result when using the starter made from sour whey, while another did best when using starter made from pure culture in milk. It seems as if it depends more on how the curd was handled than on the source of the starter used, whether from sour whey or milk, provided the maker knows how to manipulate the curd. Some makers prefer the use of the milk starter because they can distinguish more readily when it is in a fit condition by the thickness of coagulum, whereas in whey there is no coagulation and therefore the degree of acidity is not so readily arrived at. If the dairyman obtains a pure whey in which to cultivate the starter there is no reason why good results should not be obtained. No hard-and-fast rule, however, can be laid down regarding the amount of starter to use.

It must be varied from time to time. While one-half might do at one season of the year, one-fourth or even one-eighth per cent. will be sufficient at another. The personal equation is the most important factor in cheesemaking. Clean milk manipulated by an expert maker will give first-class results whatever the source of the starter employed, provided only the starter is pure.

Many of the best makers add a few drops of starter in the evening, the amount varying according to atmospheric conditions. By thus doing a slower ripening occurs; this it is alleged gives a finer cheese than when a large quantity of starter is added at a time and the ripening of the milk unnecessarily hastened. One particularly great advantage is that the introduction of a few drops of starter in the evening aids in the development of lactic bacteria, and thus the multiplication of obnoxious kinds is retarded. A great benefit claimed is that gassy cheese is seldom known. It is unnecessary to state that the greatest care must be exercised in practising such methods. Just to give an idea of how little is added, I may mention that Mr. McAdam who had 230 gallons of milk per day put in 1½ drachms in the evening (the milk being cooled to 76 degrees Fahr.) and 6 ozs. in the morning two hours before rennet was added. There is no doubt that an excessive amount of starter is dangerous, and in our warm climate it must be used in moderation. It is evident that the more starter added the quicker the ripening, and the earlier deterioration occurs, and *vice versâ*, even though the acidity at renneting be the same as when little starter is added. In other words, the quicker the ripening of the milk before renneting, the sooner the cheese will ripen and *vice versâ*.

One good maker informed me that he did not use the pure culture starter, his method being to keep back as much milk as he thought sufficient as soon as the milk was ready to rennet. By next morning this would be thick. I tasted this starter and it was good. This of course is right enough when the milk is good. Evidently the maker in question finds it so, as he has gained many prizes at the leading shows throughout Great Britain. Still it will probably be the safest way to stick to the pure culture starter.

In addition to the experiments just mentioned, some were made to ascertain the best quantity of rennet to use. Several cheeses were made at the Kilmarnock Dairy School.

(*A*) 2½ ozs. rennet added to each 100 gallons of milk.
(*B*) 5 ozs. rennet added to each 100 gallons of milk.
(*C*) 7 ozs. rennet added to each 100 gallons of milk.

The judges who had tested these cheeses along with the former experimental lots gave an average of 95 points to the cheese getting the small amount of rennet. After an interval of a few months, however, the cheese that received 5 ozs. per 100 gallons received the highest marks. It is generally thought that 4 ozs. is about right.

(*To be continued.*)

GARDEN NOTES.

J. Cronin, Inspector Vegetation Diseases Acts.

The Salvia.

Salvia is a large and widely distributed genus of plants, including annual and biennial, perennial herbaceous, and evergreen species. The salvia has been found native in various parts of Europe, Asia, Africa, and

SALVIA AZUREA.
Pale blue.

SALVIA, "GLOIRE DE STUDGARDT."
Bright scarlet.

America, some of the most ornamental species being natives of South and Central America. A number of the herbaceous species have been cultivated in Victoria, many of which were insignificant as ornamental plants, while others, as *S. azurea* and *patens*, are, on account of the beautiful shades of colour of their flowers, most worthy subjects.

The most popular salvia cultivated here is "Bonfire," a garden variety specially valuable for its display of bright scarlet flowers during the summer and autumn months. "Gloire de Studgardt" closely resembles "Bonfire," being somewhat heavier in type of flower and habit of growth. Either

kind is valuable for decoration of mixed groups or for bedding purposes. The flowers do not last long on the bushes, but the calyx, which is about half an inch in length, is also bright scarlet, and lasts for a considerable time. There are several other shrubby kinds that are worthy of a place in the garden, being free blooming plants, and of easy culture. The common sage, *S. officinalis*, is a member of this genus, and is not more hardy than several varieties grown for their flowers.

CULTURE—PROPAGATION—VARIETIES.

Most of the salvias will grow into nice bushes from 3 to 5 feet in height, and flower well in any fair garden soil. "Bonfire" may be seen growing in the public gardens and nurseries in any part of the metropolitan district, thriving splendidly in the most widely different soils. If the plants are given a fair amount of water during the summer, and are sheltered from devastating winds, they will grow practically anywhere.

S. patens requires a cooler soil and more shaded position to attain perfection than other kinds. It is one of the most beautiful of the genus, producing spikes of bright blue flowers. This variety is tuberous-rooting and is propagated by divisions of the tuberous roots in spring, or from cuttings of the young shoots in a hot house or hot bed frame. It produces seed freely and young plants raised in spring in pots or boxes of soil placed in a cold frame will bloom during autumn.

S. azurea produces flowers of a pale blue colour, and will thrive under ordinary border treatment in almost any kind of soil. The habit of growth is loose and straggling, the plants requiring to be staked and trained as growth advances. Propagation is effected by divisions of the crowns in spring, the plants producing sucker-like growths like a chrysanthemum.

In many gardens salvias "Bonfire" and "Gloire de Studgardt" are treated as annuals, young plants being raised each season from seeds. The plants seed freely during summer, and this method is undoubtedly the easiest. Seed should be sown for early planting in heated frames, for later in cold frames. The plants are cut down by frost in winter unless protected. In the various metropolitan plant nurseries, thousands of young plants are propagated each spring from cuttings taken from plants that have been grown in glass houses during the winter months. The plants are watered sparingly during winter, and are placed in heat and started into growth early in spring. Cuttings of the young growths about 2 inches long are inserted in sandy soil and root readily, after which they are potted and kept growing, and gradually hardened preparatory to being planted out in October and November. Such plants will bloom early in summer, successive plantings till early in January ensuring an abundance of bright flowers until winter. In places where frost is not severe the old plants will survive and break into growth near the base in spring. They may be pruned back to the young growths, and will make large plants during the summer, but on the whole, young plants each season, whether from seeds or cuttings, are more satisfactory. Other shrubby kinds worthy of culture are:—Bethelli, bright rosy pink flowers, tipped with white; Bruanti, scarlet; Hoveyi, dark purplish blue; Grahami purpurea, purplish crimson; Rutilans, majenta; and splendens, scarlet. These are evergreen shrubs that may be propagated from cuttings inserted in sandy soil in autumn.

Flower Garden.

Preparation of ground for winter planting and material for enriching the soil according to the needs of plants grown are important at present. Most of the summer and autumn blooming plants will continue to flower more or less this month, and little can be done but maintain neatness until the time arrives to prune, store, or transplant the different classes.

In preparing new beds one of the most important considerations is, that the whole area is well under-drained. It is of even more importance than the character of the soil, for no matter what plant food a soil may contain, it remains inert and useless unless an effective system of drainage exists. Well drained soil when cultivated is always warm and moist—conditions positively necessary for the perfect development of plant growth. Organic matter in the soil is decomposed and made available for plant food by the action of air, with its elements oxygen and carbonic acid gas, which is constantly in attendance on water moving through the soil. The proper depth to set the drainage material varies according to the depth of the clay or other sub-strata. In heavy retentive soils with a strong clay bottom, shallow drains set a few feet apart are best; in deep light soils the pipes or other drainage material will need to be placed in the clay no matter how deep it may be, to be thoroughly effective.

Where possible a compost heap or pit should be made, in which leaves, stems, and general garden rubbish may be partly decayed before being dug into the soil. Stable manure should be mixed through the compost and the whole mass occasionally turned over and watered if dry. Lime should not be added or any ammonia that may be present will be dissipated.

Mr. B. V. Rossi, nurseryman, Coburg, is one of the most successful exhibitors of roses in Victoria, and it may interest readers of the *Journal* to know how his rose beds are prepared. Initially the soil is thoroughly drained by means of agricultural pipes set at a depth of about 2½ feet below the surface. Then the ground is trenched to a depth of about 2 feet, the bottom broken, and a layer of stable manure of about 3 inches in depth placed over the bottom of the trench. About 6 or 8 inches of soil are placed over the layer of manure, and another layer of manure follows, then soil again, and again manure, the top spit from the next trench being placed as the surface of the prepared bed, which is raised several inches over the former level by the working and addition of manure. The last layer of manure is placed at a depth of about a foot below the surface of the bed. Mr. Rossi describes his operation as 3, or 4 sandwiches, as the case may be. A large amount of manure is used, probably at a rate exceeding 200 tons to the acre. When thoroughly settled by rains, the beds are planted, August being chosen as the most suitable time to plant. The soil is heavy black volcanic loam, and the plants receive no artificial watering.

Seeds of sweet peas may be sown now. The most suitable soil is a fairly heavy, well drained loam, although quantities of splendid blooms are produced on sandy soils near Melbourne. Stable manure is the most suitable fertilising agent, a little bone-dust, or superphosphate, also being of great benefit. Plenty of space should be allotted each plant, the most common mistake being sowing the seeds too thickly. Plants of hardy annuals raised earlier in the year may be transplanted to their flowering quarters. A fair amount of room should be allowed for each plant, a greater number of and far finer, blooms being produced by a few plants well grown than by a quantity over-crowded and half-starved.

Bulbs of various summer-blooming species may be planted.

Vegetable Garden.

Ground should be prepared as it becomes vacant, for future cropping. A dressing of lime to soil that has been cropped for some time is most beneficial. The staple of the soil may often be easily improved, sandy and light soils by the addition of clay or strong loam: heavy soils by the addition of ashes, lime rubbish, coarse manure, weeds or any material calculated to make it more open and porous.

Asparagus tops should be cut away as they wither, and a dressing of short manure worked into the beds. A dressing of salt may be applied later in winter or early in spring.

Plantings may be made from former sowings, and seeds sown for a succession of various saladings, &c.

MAIZE CULTIVATION.

Mr. J. Clifford, Sarsfield, writes:—"About fifteen months ago, I received five small samples of maize gratis from the Department of Agriculture. I grew the lot, and picked out the Eclipse variety as being the best; this season I have grown about 10 acres from the seed saved. The photograph of the accompanying illustration was taken on 26th February, less than four months after sowing. The plants had then attained to a height of over 13 feet, and were cobbing well.

"This crop is the seventh consecutive one of maize on the same land, which was unmanured. The cultivator was run through the rows four times before the end of December. The rainfall was as follows:—November, 2.20; December, 1.86; January, 1.37; February, 0.53."

DAIRYING UNDER DIFFICULTIES.

(From Report to the Chief Veterinary Officer on an Inspection of Dairies in the Fern Tree Gully Shire.)

J. S. McFadzean, Dairy Supervisor.

Acreage Farmed.

That the Fern Tree Gully Shire is limited in its present dairying capabilities can be understood when it is noted that, out of an aggregate area of about 21,000 acres on which this is the principal branch of farming engaged in, only some 3,000 acres have been cleared for cultivation. About 1,500 acres of this are laid down in grass, 900 acres are used for the growing of hay and green feed, the balance (600 acres) being taken up by fruit trees and potato crops. Of the remaining 18,000 acres which form the larger portion of the farms held, practically the whole is as yet rough bush land.

Necessity for Cultivation and Rotation.

Considerable portion of this is from time to time subjected to a burning-off, which temporarily clears the ground of brush and leaves, and encourages a fresh growth of native grass, having in its young green stage some nutritious quality. Some attempts have been made in a rough way to introduce English grasses to these areas by sowing the seed on the burnt ground in the autumn; but, though the seed germinates freely under these conditions, the strong growth of scrub and ferns that springs up completely smothers the young grass. The only effectual way to establish pasture land here is by first bringing it under the plough; even then the paddocks need constant attention to keep down the scrub that inevitably reappears after the ground has rested a few seasons, and which, if neglected, soon develops into a forest of saplings. This really means that to keep the pasture land at its best it requires re-cultivating and re-sowing periodically; and this is what the Department of Agriculture has always advocated as being most profitably effected in connexion with the rotation system of cropping.

Besides the farms which together form the above acreage there are several places cleared, and others partly so, that are used for grazing purposes for sheep and young cattle. These latter are usually the property of dairymen carrying on business nearer the metropolis, and whose limited home accommodation necessitates their looking further afield for pasture for their growing stock.

The Class of Soil.

In a general way the soil of the shire may be classed as from fair to good. Of this latter class, the valleys lying between Fern Tree Gully township and Lysterfield are exceptional. The bulk of the hilly country that runs between Upper Fern Tree Gully and Menzies Creek, and across the Sassafras to Olinda, is of a loose chocolate-coloured volcanic nature, and may also be classed as above the average. The more low-lying portion of the shire extending from Bayswater through Scoresby towards Dandenong is generally more of a grey-coloured, slightly sandy, but hard setting soil,

but from which fair returns are obtained in most instances. It is here, and in the valleys previously mentioned, that the principal dairy farms are situated. Fruit growing may perhaps be said to be the principal occupation of the majority of the residents. Many of the orchardists, however, also milk a few cows, and, as a sequence, pig raising and fattening to a limited extent are also engaged in.

THE DAIRY COWS.

Most of the cattle are raised on the farms, and the separator is in almost universal use where there is work for it. Excepting for the use of this machine, which in many cases has but recently been purchased, the dairying methods and accommodation are very primitive. Practically no records of milk or butter production are kept, and comparatively few cows are met with that would suggest that much thought had been given to their breeding or selection. Still, as the majority of the bulls are pure bred, and as the general expressed intention is towards better stock, some noticeable improvement in the future may be anticipated. Some of the old established herds of the shire, however, show that general evenness and quality that are usually characteristic of a paying dairy farm. As in other neighbouring districts the principal cream suppliers' stock generally show more or less of the Jersey; the notable exception being Mrs. Quinn, of Lysterfield, whose herd of 80 head is the largest amongst those who are using the separator regularly. Together with the two largest milk suppliers, viz., the Salvation Army farm at Bayswater, and Messrs. Selman Bros., of Fern Tree Gully, whose herds also average about 80 head, this owner is, judging from the cattle, more in favour of the Ayrshire breed. For number, evenness, and quality combined, Messrs. Selman Bros.' Willow Vale Ayrshire herd stands alone in the shire; the farm itself viewed from the surrounding hills as it lies in a beautiful fertile valley is really a picture. Mr. Allan Selman of Blackwood Park also has a select herd of some 20 milking Ayrshires in which he has developed udder capacity and size of teats well on towards perfection. Mr. Cecil Davies of Bayswater, who is a newcomer to this district, has brought with him some high-class Jersey stock that should prove of great value in assisting to raise the general grade of dairy cattle in the neighbourhood; for, in addition to the distribution that will be effected by the prospective sale of young stock, he has generously agreed to allow the service of his stud bulls to those about him at a reasonable fee. This owner is exceptional here as one who keeps individual records of the work of his cows.

Amongst the smaller dairies those of Mrs. Nickless, and Messrs. Monk, Friberg, and Pigdon of Fern Tree Gully, and Grant of Monbulk, show results which though not in themselves surprising are still well in advance of those generally obtained by the farmers in the shire, being from 15 to 17 lbs. of cream weekly per cow in January. Mrs. Nickless, with nine cows on 40 acres, 3 acres being cultivated for green stuff, and 27 in grass with a running creek frontage, has succeeded up to the stage of having bred an even lot of crossbreds bearing something of the old Alderney in appearance, and returning 150 lbs. of cream weekly. Mrs. Dobson of Bayswater and Mr. T. Dobson of Scoresby have also well-cared-for herds of some 20 head that give fair returns. There is a milking machine in use at Mr. G. W. Chalmers' farm at Upper Fern Tree Gully. This owner states that he had difficulty with hired labour, but is now able to put through his 32 cows in 1½ hours, and be satisfied that the milking is done properly. A double

set of tubes is used. The udders being washed, the tubes are fixed to the first two cows, with the receiving can between them. The next two cows are then seen to, and, as soon as the flush of milk is drawn from the first two, the tubes are moved on to the second pair, and he strips the first cows out by hand; and so on, using the machine to its full working capacity. The cows take kindly to the innovation, and a leg-rope is seldom used.

WANT OF FORETHOUGHT AND FOREWORK.

The water supply of the shire is its especial feature. The springs of the hills form creeks for the lower ground; and there is a fairly well distributed rainfall sufficient for all requirements. This abundance of water probably is the principal reason for the farmers making almost no provision for conserving green feed; the silo being a regrettable rarity. The last two summers, however, proving exceptionally dry, have found those least favorably situated totally unprepared; and a diminution of dairying returns has resulted. It is possible, therefore, that some good effect may be brought about by this, for the lesson thus severely taught may be the means of inculcating the principle of being prepared as far as possible for all seasonable variations, which can most easily be effected by the use of the silo.

EXTENT OF DAIRYING.

Altogether there are some 140 farms engaged more or less in dairying in the shire, with an approximate total of 1,300 milking cows, or about an average of nine cows per farm. Of this total the hilly country has about 400 head on 60 farms, or an average of less than seven per farm. This refers only to farms which sell dairy produce, for on nearly every place some stock is kept, if only to supply the household with milk and butter and raise a vealer. Here, too, the stock is in most instances of a decided mongrel appearance. Where ancestry is at all discernable it is the usual Ayrshire or Jersey. The latter have decidedly the best of it both in their coat and udder capacity, and the owners affirm that their appearance is backed up by results.

LIMITATIONS THROUGH DEPENDENCE ON GRAZING.

In this hilly country the extent of the dairying operations is strictly limited by the area which each farm has sown to grass and cultivated for green feed or hay. The principal mistake which new settlers in the district are apt to make is in not taking this fully into account, they being thus apt to err through overstocking. Acreage of bush land with native grass has very small value here when gauged by butter returns, for, though a limited number of young dry stock will keep in fair condition on it, it will starve down a milker in remarkably short time. With clearing and cultivation, however, the fertility of the soil becomes apparent. Cocksfoot and clovers are the grasses most commonly sown; and the red clover especially can be depended on to make good growth and establish itself permanently.

MARKETING PRODUCE.

Potatoes and fruit growing are the other branches of farming mostly taken up by the settlers in this district; and, when the difficulties of marketing this class of produce are compared with that from dairy farming, the latter would appear to be the most suitable. The roads are

both steep and rough, and railway freights are high through the break of gauge on the Gembrook line necessitating re-handling at Fern Tree Gully. Both these items are of greatest moment when marketing such bulky products as fruit and potatoes, and are of least import when moving such concentrated produce as cream and butter. These latter products have also everything in their favour in their weekly returns and more settled market value.

NECESSITY FOR MANURE CONSERVATION.

Again the dairy farm, when properly attended to, is practically self-supporting in the item of manure, an item of considerable magnitude on other than first-class land; whereas both fruit and potatoes, if not farmed in conjunction with dairying, call for some portion of their monetary returns to be expended in purchase and freight of artificial manures. Several instances are met with in this district, where the lack of attention to the conservation of the farm-yard manure is allowed to lessen the profits. This most valuable product is left lying in the stock-yard to be broken to dust and blown away, or washed down by each shower to the nearest water-course; while the owner purchases artificial manure to, in some measure only, replace it. Where stock is kept the necessity for purchasing fertilisers should be reduced to a minimum.

WINTER CARE OF CATTLE.

Although the advantages of housing or rugging cattle in winter have been trumpeted throughout the length and breadth of the land, it is strange to find that here, where if anywhere, those advantages would be most marked, the matter has been altogether overlooked. The majority of the milking cows are perforce allowed to dry off in the cold months through want of attention in this respect, combined with the neglect to grow succulent fodder, which has been previously commented on.

DAIRY SANITATION.

Where the milking stalls have been floored it has usually been with roughly-laid slabs, and the results have not been satisfactory, as the urine undersoaks and stagnates beneath them, giving rise to odorous emanations which cannot but affect the milk prejudicially. There are, however, good grounds for the hope that, as a result of personal conferences between the farmers and dairy supervisors, this defect will in great measure cease to exist. As showing that where there is a will there is usually a way to be clean, may be cited the case of a farmer in an out-of-the-way corner of the shire where flooring material, other than wood, is difficult to obtain. Though the flooring is of the usual wooden slab formation, provision had been made in this instance for carrying off the drainage by leaving the slabs at the rear of the stall movable, and placing an underneath flooring at that part of corrugated iron laid crosswise beneath it. After sweeping, the flushing of the slabs carried all dirt down this iron drainage way, and a little dry lime scattered on the floor assisted to keep the shed clean. The tarring of the corrugated iron on both sides considerably lengthens its term of usefulness. It would also be a considerable improvement to soak the wooden slabs with boiling tar before laying them. But above all to secure imperviousness or prevent under soaking of a wooden slab floor, the slabs require to be squared evenly, so that close joints may be secured. Then, if these joints are grouted with tar and sand, the job

is almost as effective from a sanitary point of view as a brick floor, cement grouted.

Groundless Fears.

As has been noted by supervisors in other districts, there has been here also a certain amount of apprehension among farmers as to the possible requirements of the Department in the direction of construction and situation of dairy buildings, and some most erroneous and even foolish reports had gained currency. To some extent this had resulted in a certain amount of stagnation in the industry, for owners, instead of proceeding with such improvements as they had intended to make, had allowed matters to stand over till the supervisor called, in case—as they said—that those improvements should not be "in accordance with the Act." If it were not for the loss of time which has resulted to many people who thus worried themselves by doing nothing, this matter might be treated lightly; but to find men, within daily postal communication of the Government Offices, suffering themselves to be deluded into believing that the Department of Agriculture would deliberately put any one of them to *unreasonable* expense is hardly conceivable. But such has been the case, with the result as stated, and those who failed to allow their dairying operations to make their normal advancement now find that they are in several ways losers through their want of confidence or inactivity. If these farmers, instead of listening to idle talk, had communicated direct with the Department, or had even carefully read the *Journal of Agriculture*, they would have soon been made aware that the intention of the Act was to obtain cleanliness and hygenic conditions in dairying with as little expense as possible, and so to assist the industry instead of hindering it. In actual practice, it has been found that where a dairyman has kept his animals under reasonable cleanly conditions, by providing a reasonably dry and sanitary floor surface, and by arranging for the proper removal of manure and drainage from stalls and styes in order to preserve the atmosphere surrounding the dairy buildings in as pure a state as possible, and has also kept his separating and cooling rooms clean, any suggestions that may further be offered for the more convenient handling or improvement of his produce are appreciated, and acted upon. On the other hand, where those very necessary conditions have been given little or no attention, and the farmer has carried on his dairying amidst filthy, bad-smelling surroundings—as unfortunately many do—then truly there are some drastic and immediate alterations necessary and demanded, and, as might be expected, it is by this class of dairyman that improvement is looked on in the light of injustice. Even then, however, the required alterations are not always necessarily expensive, for there are few locations which do not naturally furnish gravel, stone, or timber; any of these, with the addition of cement or lime and sand, can at a small outlay, be worked into an impervious flooring, and the facility with which the cleaning up and general work can be executed under the improved conditions more than repays the cost of construction.

Healthy Stock.

Comparatively little disease has been known in the stock of the shire for some years past. Tuberculosis—externally evident—has on recent inspections been found in only about 1 per cent. of the milking cows; so the district may be said to be in a comparatively healthy condition in this direction.

COMMENDABLE FEATURES.

There are two items deserving of special notice in connexion with the milk supply farms before mentioned. One is the systematic handling of the milking, cooling, and subsequent washing up of utensils as carried out by the Selman family on the Willow Vale farm. The work is so well apportioned among its several members that the milk is cooled and in the delivery waggon starting for the station, and the dairy again clean and tidy, before the last of the cattle is out of sight of the milking shed.

On the Salvation Army farm the extreme quietness of the cattle is a prominent feature. Here the herd is put through the milking process in a shed of 54 bails without any of them being fastened up. The shed is filled, and the entrance door closed, and each cow stands free in her stall till all are milked, when, the large doors being again opened, they all back quietly to the passage way and walk out, to be replaced by the rest of the herd. When it is mentioned that the milking is done by some fifteen lads, from about ten to fourteen years of age, under the supervision of a shed manager, who places no undue restraint over their naturally boyish mirth so long as the work is done properly, it speaks volumes for the consistent treatment of the cattle to see them chewing the cud so contentedly while the lads scud about amongst them.

CABBAGES AS FODDER FOR THE DAIRY HERD.

P. J. Carroll, Dairy Expert.

There is always a blank in the green food supply of the farm between the time when the last of the spring growth is exhausted and the first of the summer crops is fit to use. In other words, between the time when

FEEDING THE DAIRY HERD.

the oats and green grass are finished and the maize or sorghum is fit to cut. To meet this annually recurring want no better method can be adopted than to plant a small area with some variety of cabbage.

Recently I paid a visit to Mr. D. Clarke's farm at Noorat, and inspected a plot of "Drum Head" cabbages grown for fodder for the dairy herd. This crop provides a large amount of succulent fodder for summer use,

SOME HEAVY WEIGHTS.

and in a favorable season the yield eclipses that of most other fodders. One advantage which is considerable when compared with root crops is the fact that no preparation is required, the cabbages being greedily consumed in their natural state by the dairy cows. I was informed by Mr.

40 TONS TO THE ACRE.

Clarke, jun., that the dairy cows were fond of cabbages as food, and, as far as he could learn, no injurious effect was produced in the milk. As an evidence of the amount of fodder produced on a small area, I may mention

that a space of 50 x 32 yards provided for 140 cows for ten days. Of course, the cattle had the run of the ordinary dry pasture as well. According to the above, a little less than 1 acre would furnish 30 days' fodder for this herd, or the field of 4 acres would serve four months. From an average spot in the field, 12 feet x 12 feet measurement, 24 heads of cabbage were cut, weighing from 4 to 22 lbs. each, a total weight of 301 lbs., or an average of 12½ lbs. each. The actual yield per acre would be about 40½ tons. Cabbages measuring 3 ft. 6 in. in diameter, and weighing up to 37 lbs., were to be found in the paddock.

The land, previous to planting, was thoroughly cultivated and treated with a liberal dressing of farm-yard manure. The plants were grown from seed, and transplanted in the months of September and October in drills 5 feet apart, with about 2 feet between each plant. It is said that two

A GOOD SPECIMEN.

men can plant an acre a day. The area selected for cabbages should be well manured, as few farms have richer land than this near Noorat. As a matter of convenience the acre or two selected should be near the house, as the care of the young plants after transplanting can often be made to fill in odd half hours. All young crops respond to nursing in their early stages, and it pays better to get a heavy crop off a small area than half a crop off a large area.

The nursery bed for raising the young plants should be in a sheltered corner of the garden. An area of 100 square yards is sufficient to plant an acre, the seed being planted in drills 1 foot apart. It takes about 1 lb. of seed to plant an acre. A little superphosphate or bone dust scattered along the drills will make the plants grow more quickly.

Mr. Clarke has been growing cabbages for his cows for a good number of years, and is thoroughly satisfied with the result. He states that he has had much better crops, the season just passed not being as favorable as previous ones, owing to the excessive rainfall in the early part of the season, and the absence of any rain in the latter part, with the result that

the growth was not so rapid or so good as usual. There are other fodder crops, kale and maize, grown on this farm, but they are likewise very light, and not even as good in proportion as the cabbage. From observations, I should say that every dairy farmer would do well to plant a few acres of "Drum Head" cabbages for the use of his dairy herd, as it insures a large quantity of succulent fodder at a time of the year when it is most needed.

THOUSAND HEADED KALE.

On the same farm was to be seen a small paddock of lucerne fully 12 inches high, looking healthy and green—a striking contrast to the parched-up paddocks around. It is astonishing that more of this magnificent fodder is not grown in the Western District. Any question as to whether lucerne can be grown successfully should be settled by a glance at this paddock, and I feel sure that if many of the dairymen in the vicinity of Noorat were to make an inspection of the crop referred to at the present time, they would have no hesitation in putting some of their land under lucerne.

FRUIT FLIES.

C. French, F.L.S.; F.E.S., Government Entomologist.

The Mediterranean Fruit Fly.

Halterophora capitata. Wiedmann. (*Diptera.*)

This terrible scourge of the fruitgrower is becoming but too familiar in Victoria, the larvæ having been found in peaches, pears, quinces, apricots, plums, nectarines, guavas, oranges, lemons, apples, citrons, loquats, mangoes, pumpkins, bananas, tomatoes, pineapples, and persimmons; so that it will easily be seen that hardly any fruit can be said to be exempt from its attacks, and of all the fruitgrower's enemies the fruit-fly is undoubtedly the worst.

As this article is written especially for the growers, technical terms and descriptions are avoided where at all possible, so that the coloured plate drawn from nature will be the more easily understood. Unfortunately for Victoria, we are now having a very practical experience of this pest. Numerous cases have occurred, so far most of them in private gardens in the northern districts of our State. The danger has, we hope, been grappled with, and the pest, at least partially, stamped out, by the adoption of drastic measures.

One great danger lies in the fact that many well-intentioned persons suppose, or profess to suppose, that fruit-flies will neither live nor thrive in Victoria. This is a most mischievous, as well as a dangerous theory, as the writer knows from actual experience that in Victoria the larvæ and also the flies will live for weeks exposed to the air by day and night, during both summer and winter, and, as showing the vitality of the larvæ, these have been kept by Mr. Fuller, Government Entomologist of Natal, for over three weeks in a freezing chamber, and at the expiration of this time, the perfect insects have been reared. It is to be hoped that none but the most careful will try to rear these flies artificially, for should this pest obtain a footing, which is extremely probable, the fruit-grower will have to pack up and be off, there being, at present, no known remedy. But nature may provide, in the shape of some parasite, a means by which the fly may be kept in check, if not stamped out altogether!

In writing of the above insect, Mr. Froggatt, Government Entomologist of New South Wales, who, with Mr. Tryon, of Queensland, has had constant opportunities of watching fruit flies in the orchards and elsewhere, remarks that this fly is quite a modern importation, as it was not until 1897 that it was discovered in orchards near Perth in Western Australia, and shortly after this, Mr. Froggatt found them flying about in the breeding jars from peaches supposed to be infected with the Queensland Fruit Fly (*Dacus tryoni*) which had been obtained at the Sydney Fruit Markets. Mr. Froggatt further remarks in his valuable treatise *Notes on Fruit Maggot Fly*, "That though previously unknown in the Colonies it had a well known record in Europe as far back as 1826, when it was described by Wiedmann as an orange pest, under the name of *Citriperda capitata;* and a few years after by Macleay, who published a large coloured plate of the perfect insect. In this paper he, Mr. Macleay, stated that fully one-third of the oranges shipped to London from the Azores were rendered unfit for use before reaching their destination through the presence of this maggot when they were packed.

"Early in 1890, an article appeared in a publication known as *Insect Life* where the fly was described and figured as a peach pest in the Bermudas. It was said to attack green and half-ripe peaches and mandarins most, and one correspondent reported that the larger oranges were not attacked.

"In 1892, J. H. Cook gave an account of the Orange Fruit Fly, in Malta. He stated that the whole of the oranges had been destroyed during the last two years by this maggot, and that a Commission had been appointed by the Governor to report on the best means of checking this pest. In the following year a pamphlet was published in the *Mediterranean Naturalist* by Professor N. Tagliaferro at the expense of the Agricultural Society of Malta to give the orange growers a popular account of the fly. He advised them to 'smear a few oranges on each tree with honey, so that the adult fly would in gathering round them be caught and destroyed.'"

Miss Ormerod in *Notes and Descriptions on a few injurious Farm and Fruit Insects in South Africa* records *Halterophora capitata* as one of the serious pests of the fruit-growers in South Africa.

In Malta, as has already been stated, we are informed that the Mediterranean fly does great damage to the orange crops, and according to the Revd. Mr. Henslow, its attacks appear to be confined to oranges only.

In a late number of the *Agricultural Journal of the Cape of Good Hope*, Mr. Lounsbury gives an account of how the trees are netted to protect the fruit from these flies. But unless fruit is much more valuable than it is at present in New South Wales, it would not pay to treat the trees in this manner, as he says it costs about 3s. per tree to protect them by this process from the flies.

Mr. Fuller, formerly an Australian, but now Government Entomologist of Natal, gives the following account of the habits of this insect, as observed by him, and which was for some time known to us in Victoria as the West Australian Fruit Fly:—"The eggs are laid in the fruit by the female fly, and the larvæ are soon hatched from them and commence feeding. When they are full grown the maggots leave the fruit and enter the soil to pupate, that is to change into the last stage prior to their emergence from the soil as perfect insects, and great numbers are carried to the ground by the falling fruit. After having rested in the soil as pupæ for about twelve days the flies hatch and make their way to the surface and continue their destructive work."

The following is an account of some experiments, dealing with the Mediterranean fly, which were carried out by the Assistant Entomologist (Mr. C. French, jun.) and myself during 1906. The results of similar experiments made by Inspector Farrell at my request are also given.

The larvæ of this fly were found in bananas imported from Queensland on the 14th August, and on being placed in the breeding jars pupated on the 20th August; the perfect insects emerged on the 4th October and lived for several weeks, water, with a little sugar added, being the food placed at their disposal. Larvæ were detected in oranges from Maryborough (Queensland) on the 19th September, and pupated on the 24th September; the perfect insects commenced to emerge on the 26th October, and continued emerging till the 30th. On the 2nd November several cases of Seville oranges were sent from Sydney. These were badly infested with larvæ of the Mediterranean fruit fly; on being placed in the breeding jars they pupated on the 6th November, and the perfect insects were hatched out on the 3rd December. No less than 60 flies were hatched from two Seville

oranges and the perfect flies lived ten days without food. The Mediterranean fly has also been reared from tomatoes sent from Queensland. The larvæ of the fly curl up and by a muscular movement jump fully one foot. I placed various fruits with these flies, but could not get them to deposit eggs in them.

These flies are very active at night if exposed to light, and possibly might be attracted by placing a lamp amongst the trees, the lamp to be placed in kerosene.

Inspector Farrell reports the results of his investigations in connexion with the Mediterranean Fruit-Fly and its habits as follow:—"I placed fully-grown larvæ in a jar on the 12th February. Flies hatched out on the 25th, *i.e.* thirteen days later. These were placed in a tin box containing some earth and covered over with a mosquito curtain; sliced tomatoes and peaches were put in with them, and the box was left out in the open air. Flies fed on the tomatoes, but punctured peaches and deposited eggs in them. The flies died on the 21st March, twenty-five days old. Other flies which were hatched out on the same day but got no food, died on the 1st March, four days old. I reared from the peaches a number of larvæ which went into the chrysalis state on the 15th March, and I expect them out on the 30th or 31st March.

On the 15th March I saw a fly on a peach in Constable Collins' garden. The fly must have just laid. I secured the peach and kept it under observation. At first there was no puncture visible, but afterwards one became pronounced. I reared five larvæ from this peach; these were fully grown on the 25th March and went into chrysalis on that date.

In connexion with egg-laying I find that from four to seven eggs are laid in each puncture or chamber, and not alone does the fly puncture the fruit, but it also constructs an oval-shaped chamber which is apparently lined with a tough brownish substance. Mr. Carmody and I, at Numurkah, found four tiny elongated eggs of a dirty white colour and these when seen under the lens shone similarly to the body of a young larva. The eggs lay parallel to each other, and occupied about half the capacity of the chamber. The young larvæ hatched out on the following day, but we did not succeed in rearing them. I have found four larvæ each in a number of peaches which had apparently only one puncture each. I have also found twelve larvæ in peaches where only three punctures each were visible. Then again I have found five, six and seven larvæ in peaches, each of which had apparently only one puncture, but I have never found less than four larvæ in any peach. Therefore it is only reasonable to conclude that from four to seven eggs are deposited in each chamber, and that four are more frequently laid than any other number. Flies are apparently not fit to lay until they are four days old.

An analysis of the above will show

1st.—That from the time the egg is laid until larva is fully grown is 12 days.

2nd.—That the chrysalis stage is 13 days.

3rd.—That the life of the perfect insect when fed is 24 days.

4th.—That from the time the egg is laid until insect which it contains dies of old age is 50 days.

5th.—That when the fly is not fed the 50 days are reduced to 29 days.

I have not been able to determine the term of the eggs' incubation."

In Western Australia, Mr. Fuller remarks, "the fruit is attacked directly it begins to sweeten and before it ripens, green fruit being seldom

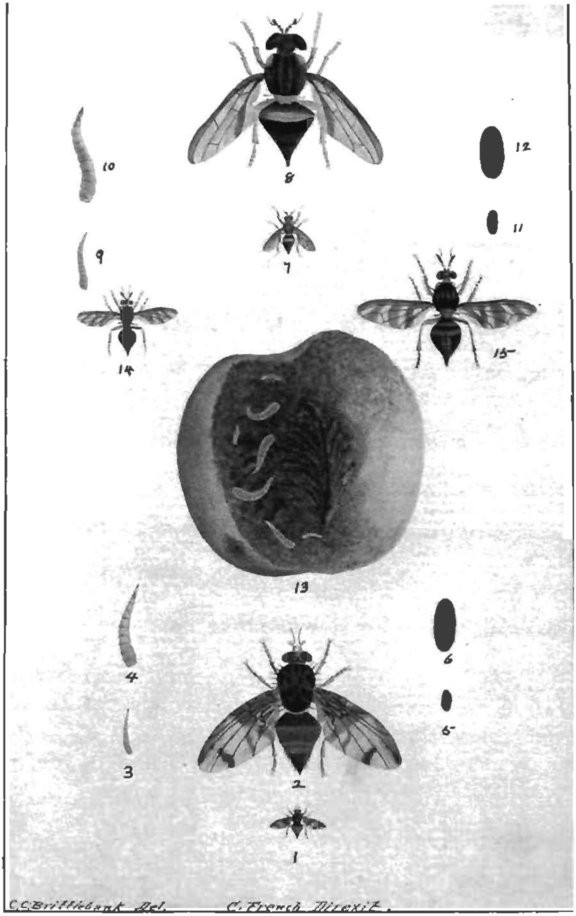
if ever attacked. The eggs are laid in the fruit by means of a very sharp needle-like organ called the ovipositor borne on the extremity of the abdomen of the female. The maggots are soft, yellowish white in colour, somewhat shining and limbless worms, and somewhat resemble those of the meat fly. The pupa and chrysalis are oval and stout, at first a golden yellow but subsequently changing to a reddish brown. The flies are pretty little insects with two wings only, about half the size of the common house fly. They have very large and lustrous eyes, the thorax is mottled with grey and black, and the abdomen is of a brownish yellow and crossed by thin stripes of a silvery grey colour. The wings are large and simple. They are transparent, strongly veined, and marked by several clouded bands of grey and yellow colour. In walking the fly always carries its wings in a drooping attitude. It is a very difficult thing to find the fly in an infected orchard, although they may be present in large numbers. If however a maggoty peach be put aside in a box for a few weeks the flies can be reared and easily observed."

EXPLANATION OF COLOURED PLATE (Drawn from Nature).

Fig.	Description.
1.	Mediterranean Fruit Fly. Natural size.
2.	Mediterranean Fruit Fly. Enlarged.
3.	Larva of Mediterranean Fruit Fly. Natural size.
4.	Larva of Mediterranean Fruit Fly. Enlarged.
5.	Pupa case of Mediterranean Fruit Fly. Natural size.
6.	Pupa case of Mediterranean Fruit Fly. Enlarged.
7.	Queensland Fruit Fly, variety Cucumis. Natural size.
8.	Queensland Fruit Fly. Enlarged.
9.	Larva of Queensland Fruit Fly Natural size.
10.	Larva of Queensland Fruit Fly. Enlarged.
11.	Pupa case of Queensland Fruit Fly. Natural size.
12.	Pupa case of Queensland Fruit Fly. Enlarged.
13.	Peach showing larvæ of Mediterranean Fruit Fly. Natural size.
14.	New Hebrides Fruit Fly. Natural size.
15.	New Hebrides Fruit Fly. Enlarged.

It has frequently been stated in Queensland and New South Wales that the flies will not attack green fruit. This is a mistake, as I have on many occasions proved eggs to have been deposited in green bananas before shipment, as no half-ripe bananas are ever shipped from Queensland to Melbourne. This fly would appear to be more numerous than are the other kinds here mentioned. No less than 60 adult specimens have been reared at our office from two specimens of the bitter or Seville oranges which had been sent from one of the northern ports of Queensland. The indications of the presence of the fruit-fly larvæ in such fruits as the citrus family are, although easily detected by the practised eye, upon the whole not well defined. The skin of oranges, lemons, and limes being more or less of a rough granulated texture renders the task of finding the infected fruit, where large consignments have to be handled, by no means an easy one.

In Victoria, at least, it is astounding with what rapidity this fly destroys the fruit in the orchard, only a few days, in the case of peaches, elapsing before the whole of it is rendered unfit for human consumption, it, the fruit, being absolutely decomposed and discoloured. In Victoria, our experience has taught us that the first fruit to be attacked are apricots, then peaches, then, as the broods hatch from the ground, other fruits, as apples, pears, persimmons, &c., are attacked in succession. From observations made in the field, I am speaking of the north-east part of Victoria,



FRUIT FLIES.

MEDITERRANEAN. QUEENSLAND. NEW HEBRIDES.

the trouble has been traced through the medium of imported fruits, bananas and oranges especially, infected fruits of both kinds being commonly obtainable in Melbourne, the suburbs, and in the country townships. Those who have carefully studied the habits of the fruit-fly are aware that their flight is but short, and judging from their habits in our Victorian orchards it would appear that the fly does not favour long distance journeys, although, as with other kinds of short flight insects, it would be possible for this pest to fly or be even blown across the Murray. This is, of course, a mere surmise, but the fact of the grubby fruit being even obtainable in Melbourne and elsewhere, goes to prove how necessary are the extra precautions now being taken by the Department. As one who has seen the fly at work both in New South Wales and Queensland, I assert that the ravages of the Mediterranean fly in Victoria are quite as bad as either the Queensland or New South Wales experiences have been able to record, half-green peaches being attacked as badly as those either ripening or ripe. The perfect Queensland fly has not, so far as we are aware, made its appearance amongst us, and we sincerely trust it may not do so.

Referring to the life history of the Mediterranean fly as observed in Victoria, the female insect punctures the skin of the fruit when the latter is in the condition of being half-grown, hard and green to that of ripe or ripening fruit, and by means of ovipositor places from five to fifteen eggs in each fruit. These hatch out in a few days, the maggots remaining in the fruit for about fourteen days. The fruit then drops to the ground, and the maggot or grub enters the earth to the depth of a few inches, and there assumes a chrysalis form, from which the fly emerges in from 14 to 20 days, according to the climatic condition. In a climate like Victoria, it is thought possible, taking the succession of fruits into consideration that we may have a fresh brood for nearly seven months in the year. It has been questioned by some persons whether this fly is found in Queensland at all, but the fact of it having been reared by us from bananas and oranges from Maryborough places the matter beyond the shadow of a doubt. If such be not the case, then the fruit must have been affected during transit, a theory which I, for one, will not entertain.

Queensland Fruit Fly.

Dacus (Tephritis) tryoni. Froggatt. (Diptera.)

This most formidable pest, formerly known by the name of *Tephritis tryoni*, Froggatt, is one of the greatest pests with which the fruit-grower has to contend. Messrs. Tryon and Froggatt have gone to a deal of trouble in investigating the life history of this wonderfully destructive little fly, thereby giving southern growers great assistance in the matter of its life history, &c.

This fly is the common species all over the fruit-growing districts of Queensland, the northern rivers and the New England districts of New South Wales. It may probably come into our State in either of two ways. First through the agency of infected fruit sent by sea, or it may be sent overland in fruit, although the latter risk is much the more unlikely than that of the former, and is merely surmise, the importation by sea having over and over again been proven.

Second-hand fruit cases, a prolific source of danger, get scattered amongst the orchards, and the fly may rapidly spread from a number of different centres. Mr. Froggatt says "I have seen fruit cases from Ryde

stacked up behind a shed on the Manning River, and at Wallerawang on the Western line. I saw hundreds of cases at a Chinaman's hut branded with the names of a score of different orchardists' names from all parts of the county of Cumberland. Now when specimens of fruits arrive at the office from any distance, I invariably find that the maggots have crawled out of the fruit and have pupated among the paper in which it has been wrapped. The little hard chrysalis adheres to the paper, and this would naturally follow if infested fruit were allowed remain for any length of time in the case; the pupæ would stick to the sides of the case, until it was returned or left in new quarters, and when hatched would infect the district.

"The only specimens of these species that have been bred in our office are those in over-ripe or decaying bananas, and other northern fruits that have been condemned on our wharfs, and would, before our regulations came into force, have been sent all over the back country. I am therefore of the opinion, that the reason why this fruit-fly has not been found close into Sydney is that the spread of diseased bananas has been controlled by our fruit inspectors. The maggots are always found in over-ripe or decaying fruit or in cracked bananas, and these are the ones that should be discarded as soon as the bunches are looked over. When the inspection of fruit first came into force, it was stated that the fruit-fly bred in the decayed stalks of the bananas; but when these maggots were placed under observation, they proved to be very distinct and harmless larvæ producing slender and long-legged flies belonging to another family.* The chief distinction between this and other fruit-fly maggots is that the fruit fly has two rows, on either side of the last segment, of little spiral reddish-brown processes (anal respiratory tubes). They all have the same cylindrical body thickening towards the tip, and the same curious black toothed mandibles. The perfect fly has clear transparent wings, with stout reddish nervures, and the general colour is reddish-brown with yellow markings. The body with its wasp-like waist and pointed body gives it a somewhat wasp-like appearance."

Mr. H. Tryon, Government Entomologist of Queensland, has had exceptional opportunities of observing the habits of this fruit fly, and, as we require all possible information of a reliable character concerning this pest, I quote Mr. Tryon's remarks on his personal observation in the natural home of this particular species of fly, as also of the same insect when in confinement.

Mr. Tryon says, "The eggs of this species are just large enough to be seen upon a dark back ground by the naked eye, the full grown maggot being about four-tenths of an inch in length. A feature of this maggot not generally known is that it is an air-breather, and that, if air be excluded from the fruit, its inhabitants must die. The chrysalis is one-fifth of an inch in length, and exists in a partly comatose condition till it develops into the fly. The male is easily distinguished from the female, as the posterior of its body is rounded, while that of the female carries the ovipositor, the pointed projectile being used to pierce the skin of the fruit and deposit the eggs in the tissue. The ovipositor can place an egg one-twentieth of an inch below the surface. When disturbed it does not fly far; but tries to hide beneath the leaves, and for this reason often goes unobserved." Mr. Tryon concludes that the average life of the insect is about five weeks, and that each fly lays about a dozen eggs.

* We have found the larvæ of the true fruit fly in the rough end of a banana stem.—C.F.

When fruit is easily punctured the fly distributes its eggs though many, but occasionally eight, and even the whole batch are placed in one fruit. It is not usual to find eggs laid in fruit before it is two-thirds grown, as the female seems to defer operating till a pleasant odour from the fruit is perceptible.

Regarding the periods of development at which the fruit is attacked, Mr. Tryon, together with Mr. Searle, furnished some reliable information. "The eggs take three days to hatch when under observation, but in the open air this will be hastened or retarded by climatic conditions. Occasionally the young grubs are killed because the growing fruit presses upon them and in other cases the young are unable to break down the tough woody tissue of immature fruit. In mellow saccharine fruits all the eggs hatch out, and the grubs mature unless the tunnel becomes closed and excludes the air. In pip fruit and slipstone peaches the grubs can live near the centre, but in close stoned fruit they must work near the surface.

"The life of the grubs in the fruit is from two to five weeks, occasionally less than two weeks. It invariably happens that when the grub has done feeding, it leaves the fruit, which has usually fallen to the ground. After leaving the fruit the grub usually tries to hide beneath the soil, sometimes going as deep as four inches, and then within twenty-four hours changes into a chrysalis.

"In summer a period of from seven to fourteen days elapses before the fly is out of the chrysalis, but in winter the lethargic condition continues much longer. There are several broods during the year, and from August to April (in Queensland and New South Wales) reproduction is virtually continuous, as females preponderate and as each lays twelve eggs, prodigious multiplication is the result. Occasionally the fly passes the winter as a perfect insect. The ability to breed throughout the year is due to the succession of fruits from loquats to oranges in winter."

Many larvæ of this fly reach Melbourne in bananas, oranges, cucumbers, &c., and have been reared by me. The habits are almost similar to those of the Mediterranean fruit-fly, but the insects sometimes take longer to hatch. The majority of larvæ placed in breeding jars on 20th August, pupated on 28th August, and emerged on 6th November; others took only six weeks to hatch, and lived sixteen days without food. Mr. E. J. O'Connor, of Ivanhoe, kept this fly alive for nine weeks by feeding it with oranges and water.

Queensland Fruit Fly.

Variety cucumis. French.

I have given the above name provisionally to the fruit-fly reared from cucumbers sent from Bowen (Queensland). It is closely allied to the Queensland fly; but the well defined yellow bands on the abdomen are wanting; the whole colour of the fly is much lighter in appearance, and the pupa-cases are a little larger. The larvæ are of a deeper colour than those of the ordinary Queensland fly, and no less than fifty eight larvæ were taken from one cucumber. The maggots were received from Queensland on 22nd October, and pupated on 25th October. The perfect insects which emerged on the 21st November, lived only twenty-four days, whereas the Queensland flies will live for weeks. The larvæ of this fly also have the peculiar habit of curling up and jumping, beating badly all previous records that I have observed of the jumping propensities of fruit-fly larvæ.

The Guava Fruit Fly.

Tephritis psidii.

I am indebted to Mr. Tryon for museum specimens of this fruit fly, and which I have not seen in its living state. In dealing with this insect Mr. Froggatt remarks: "The fly was bred out on the 4th of April from some infected guavas, which had been condemned by Inspector Butler, who obtained them from a cargo from Noumea, New Caledonia. When the guavas were examined about a fortnight before the maggots were very small, so that their development had been very rapid; probably a month would be long enough for the egg to hatch and evolve the perfect insect. The maggot did not appear to differ in any point from that of *D. tryoni;* but as they were examined in an immature state they may yet develop specific differences. The pupæ bury themselves in the soil just below the surface, and when the pupa cases are empty are light yellow, about two lines in length."

As we have no plate of this insect, I give Mr. Froggatt's description, as the pest may come here from the South Sea Islands.

"Three lines in length, expanse of wings, 4½ lines, head, light brown; eyes, rich metallic purple; antennæ, brownish yellow, with the last joint black, long and cylindrical, finely pubescent; the bristle springing from the apex of second joint, stout and long, and a few on the forehead and hind margin of the head. The thorax black, finely shagreened with only a few hairs at the base of the wings; a pale silver grey parallel band runs round the centre, with a pale yellow stripe on either side; the sides of the pro-thorax in front of the wings, and the sides of the meta-thorax marked with creamy white; the scutellum large, angular, broad in front, and thickly margined with pale yellow; a pair of stout black bristles standing out on the spiral margin; the legs brownish yellow, clothed with very fine hairs; tarsal spines and claws black. The wings are hyaline, very slightly clouded at the extreme tip; nervures black; the transverse cubital nervure clouded on either side with black, giving it a thickened appearance; the apical portion of the second costal, the base of the third costal, and the third basal cell clouded with brown. The abdomen turbinate, very narrow at the waist, elongated, widest in the centre and tapering to the extremity, ovipositor consisting of a stout horny process enclosed in a pale yellow sheath, showing a granulated structure."

The New Hebrides Fruit Fly.

Our plate shows figures of a fruit fly said to be very destructive to bananas and other soft fruits growing in the New Hebrides. The fly, as will be noticed in figure 14 is larger than any of the other fruit flies here mentioned, and particulars as to its identity will be welcomed by economic entomologists both in Australia and elsewhere.

Prevention and Remedies.

In dealing with the subject of fruit fly prevention and remedies, it should be understood that our first care should be to keep out the pest if at all possible to do so, and no measures, however strong they may be should be disregarded. The great danger of introducing fruit flies into this State is, first, through the agency of shipping consignments from infested areas; and secondly, through the medium of fruit sent by rail to some of our

Northern districts, where, owing to a congenial climate, the pest would surely spread with great rapidity, and the absolute ruin of many of our fine orchards would speedily follow.

The fruit flies, as far as we are aware, have not become permanently established in Victoria, but it would be well to see what others, who have been less fortunate in this respect, have done towards the well-nigh hopeless task of eradication. I am again indebted to Messrs. Froggatt and Tryon and others for the results of their experiences in this direction. The remedies referred to by Mr. Tryon I am inclined to agree with, and amongst other methods mentioned in the preventive stage, that is, to protect uninjured fruit from attack, I may quote the following:—

In Western Australia, the plan of placing kerosene boxes, in which kerosene has been placed, in the trees, has, so I am informed, produced the best results, no fewer than some thousands of the flies having been captured by these simple and inexpensive traps. Another method as supplied to me is as follows:—"Place three or four small tins (sardine tins being the best) in each tree, and pour a little kerosene in them. Let the tins be on an incline so that a portion of the bottom of the tin is bare, or free from kerosene. A good plan is to nail the tins by the lids left on the one side to the trunks and branches. The kerosene seems to attract the flies."

All fallen fruit should be destroyed by burning or boiling, in order to prevent the larvæ from going into the ground to change into the perfect insect, if this is not done immense numbers of flies will be bred from the infected fruit. Fine netting may also be used to cover a few trees, but this in large orchards would, of course, be too expensive.

The flies can no doubt be kept away also by offensive odours of different kinds, as preparations of tar, carbolic acid, &c., but this latter could only be done some weeks before the fruit ripened. Mr. Tryon also recommends that wood-tar smeared on pieces of rag or tan and hung suspended in the trees be adopted; and I have no doubt as to the value of this recommendation. The Italians have mixed wood-tar with soda crystals, making a perfect solution for spraying, a system which Mr. Tryon informs me has lately been published.

The shelly covering of the chrysalis renders it practically impervious to any liquid application, but if the ground is dug up or raked, so that the chrysalis is exposed, it dries up and dies. When the fruit drops to the ground, it is virtually caught in its own trap. Then is the orchardist's opportunity. If the infested fruit is gathered at least daily and destroyed, the development of another batch of flies is prevented. Burning or scalding would be most effective, but as this is not always a convenient method, it would be well to keep an open trench about three feet deep in which the fruit should be buried and a covering of the earth rammed down.

Another effective way, as Mr. Tryon thinks, would be to place between the trees some caustic substance which would destroy the tender maggot, and he has found ordinary gas-lime and muriate of potash very efficacious. Gas lime should be spread to a depth of one inch.

Dr. Cobb, who has had many opportunities of dealing with the pest in New South Wales, is not enamoured of the system as above recommended, and counsels constant cultivation so as to kill the grubs and pupæ below ground.

Finally then, the only effectual plan is to carefully examine the growing fruit, also any which may be sent to the Melbourne markets from affected

areas. In the case of growing fruit, the trees should be examined as often as possible, especially when near the time of the fruit changing colour for ripening. Upon examining ripe fruit, peaches especially, very close observance will be necessary, as the indications to even a trained eye are most difficult of detection. Should any outward signs present themselves, either as punctures or premature decay, cut some of the fruit in halves, and if the maggots be present, the damage will be disclosed.

In speaking of trapping and other methods Mr. Froggatt says, " Professor Tagliaferro's method of smearing some of the ripening fruit with honey has been noted before. One of the most practical traps in which the experimenter tells me he captured numbers of flies every night it is set has been used by Mr. L. Saunders, of Ryde, New South Wales, who places a lamp or candle in a tin surrounded with a few inches of kerosene oil and water under the infested trees, and though in their normal condition the flies rest at night, the unusual light attracts them, and coming round the light they fall into the oil and are smothered.* Prevention is better than cure, however, and the royal remedy to get rid of the fruit fly maggot is to destroy at once all fallen fruit found to be infested.

" If all the orchardists would do as a friend of mine did in his orchard at Minto (New South Wales), *i.e.*, gather all his late peaches and persimmons (over twenty-five cases) and boil them—they would find the first loss the least, for as surely as the last autumn brood of fruit fly maggots is allowed to get into the soil of the orchard, unless we have an exceptional winter, so surely will we have the Mediterranean fruit fly playing havoc with the coming year's fruit in the county of Cumberland, New South Wales. Where the ground is well cultivated in winter, the chrysalis will be turned up and have less chance of producing fruit fly, as a very slight injury at this stage of their life will kill them.

" The insectivorous birds hunt for them, and where flocks of turkeys or fowls are available, if they are given the run of the orchard during the winter, they will scratch over the surface and destroy great numbers."

One of the principal matters to be considered should the fruit flies ever obtain a permanent footing in our State, is to make ourselves acquainted with the symptoms, both external and internal, present where fruit is affected, and although we ourselves have had much practice in detecting the larvæ in fruit imported into this State, the long experience gained by Mr. Tryon in the natural home of, at least, some of the fruit flies is well worth the trouble of giving to our readers.

" It not infrequently happens that the fruit on being gathered presents externally no evidence of its being infested with the maggot of the fruit fly, and this circumstance leads to parcels, after they have been sent to the markets as sound, being returned to the grower as entirely worthless. This we found to be a very common complaint at Toowoomba (Queensland), and to emphasize this general experience, Mr. R. Bushnell handed to us three peaches freshly gathered from the tree, and in quite a green state, at the same time challenging us to detect, without the most minute examination, any external sign of their being injured, and this we were unable to do. These peaches were delivered to us on the 28th January, and after they had been securely isolated, they were put aside for subsequent observation, and on the 18th February it was noticed that five fruit flies had bred from maggots with which they must have been infested at the time of our having first received them.

*In captivity the flies are very lively, and are easily attracted by an ordinary gas light.—C. F.

"Other fruit, especially the pear, often also appears quite sound too, though it has afterwards been found to be maggot eaten. Usually, however, there is some external indication—one side of a peach may appear dull green as if slightly bruised, and the surface of a pear or plum may exhibit at spots the appearances which would follow a similar injury to these fruits. At these places it will be found that the fruit is softer than at others, and that generally the juice will exude on pressure at one or two minute holes, which, however, in the case of the peach, may have been previously detected, especially when occurring in the lateral depression.

"At a later stage, these punctures, in each of which an egg has been deposited by the fruit fly, having meanwhile been enlarged by other insects may become conspicuous objects, and the more so when, as often happens, they are surrounded by altered brown tissue.

"It may happen, also, that the surface of the fruit may be rendered uneven, and this is especially so when the latter has been early attacked. The following description of an infested apple may be taken as an illustration:

"In this case the surface of the apple appeared to have been stung all over, and although most of the holes caused by the punctures were now obliterated by the growth of the fruit itself, there was abundant evidence of the extent of the injury. The site of the puncture was marked by a minute dark spot, surrounded by a small halo of a darker green than was the general colour of the unaffected parts; these spots were each of them the centres of shallow depressions; these depressions were sometimes confluent. In cases where the last condition prevails, or the depressions are largely developed on one surface of a fruit, this becomes very unsymmetrical in shape. It sometimes happens that pears and apples when still green and hanging on the tree develop well defined patches or spots of a coffee-brown colour; these are found to be deep-seated and to be attended by the presence of a fungus.

"In several instances of fruit so affected we have detected the maggot of the fruit-fly, by breeding the latter from such specimens, but in quite as many others have failed to do so, and this being the case we are not disposed to regard this canker-like disease as being due to injuries inflicted by this pest; but such may afford the antecedent circumstances favorable to its establishment.

"An infected pear when cut through, though it may show no sign of internal injury, will exhibit numerous brown spots of different size, the sections of as many channels whose walls are composed of altered brown tissue, and which sometimes are the centres of much more extensive injury. At other times a zone of brown tissue surrounds the core. In a peach or in a plum the maggot seems to find its way very quickly to the stone, and then to feed on the tissue immediately surrounding it, usually to a greater extent on one side than the other, devouring the pulp, leaving the more fibrous material, and producing generally much semi-fluid matter as a product of decay. In a free-stone peach the symptoms usually commence in the tissue immediately adjacent to the stone; but in a clingstone the injury seems for some time to be frequently limited to the part opposite the lateral depression, and between it and the stone. Eventually all fruit which is attacked becomes a mere 'mass of corruption.' It is important to note, however, that the fruit maggot never attacks the pips or stone of a fruit nor yet the rind."

Mr. Tryon further remarks: "It is the general opinion in the district (Toowoomba) that cultivation has no influence in protecting the trees from

the visitation of these pests, nor have our observations led us to come to any other conclusion. The same may be said of neglect of cultivation, but in this case we have the additional loss due to the fact that the fruit saved is of an inferior quality only."

Before concluding this article, it may be remarked that there have been many supposed cases of fruit fly damage within the State; but upon investigation the trouble has been found to have been caused by insects which have nothing in common whatever with the true fruit-flies, either in point of size, or general appearance. When, however, we take into consideration the terrible ravages for which the real fruit-flies are responsible, (I am afraid to quote Mr. Tryon on some of these losses) it is no wonder that growers are on the alert, as they undoubtedly should be, and that upon the faintest suspicion of the pest in the orchard or elsewhere, it is earnestly hoped that the entomologist will be immediately communicated with so that the pest may be tackled promptly as was done here on a previous occasion, also in Tasmania, where this scourge of the fruit-grower has been stamped out, let us hope, for good.

The grave importance of the subject of the ravages of fruit-flies must be my excuse for having devoted so much space as is here allotted to it. I feel sure that as we are now called upon to face the fruit-fly difficulty, we are at least armed with the best experiences which have been obtained both in the orchard and in the field. The improved methods of examining fruit imported into our State, and which methods are now at our disposal, will without doubt minimize the danger of introducing, through the agency of fruit or cases, fruit-flies of any kind whatever.

The Mediterranean fruit-fly has now made its appearance in New Zealand, and when we know that this pest thrives in the elevated Armidale district of New South Wales it is idle to suppose that it will not thrive in the comparatively genial climate of Victoria.

In conclusion, it may be pointed out, that the use of second-hand fruit cases may become a prominent factor in the distribution of the fruit-fly throughout the State.

In dealing with the fruit-fly trouble now amongst us, the co-operation and assistance of all growers is solicited, and growers may rest assured that this new pest will receive no quarter at the hands of the Entomological Branch; we must rely upon the patriotism of growers in present unaffected districts to look with a friendly eye upon the apparent neglect for a time of more fortunate growers, as the Field Inspectors will have all they can do to prevent this pest from being firmly established in our State.

RECONSTITUTION IN THE GIRONDE.

M. d'A. Burney.

It was in the department of the Gironde that phylloxera was first discovered in France, and it was also here that the American vine first became largely used, even though it is still and always will be held in abhorrence in certain favoured districts where insecticide treatments and submersion have been successful in safeguarding the old French vines. Where opinions are so distinctly divided one may expect to hear much on both sides, but it is quite evident that the American vine has come to stay, and that its culture is now in every way as successful as was the culture of the ungrafted vine before the invasion of phylloxera. Spending a holiday in the Gironde, after an absence of some twelve years, I could not but be struck by the enormous increase of vineyards all through the districts with which I was familiar. Throughout the valley of the Dordogne from Libourne to Bergerac the train passes through a perfect sea of vines, even covering the steep slopes of the hills overlooking the valley. Often the ground was even terraced as in the Rhine Valley, but always the expense of carrying back the earth washed down from the steep slopes by the rain is an item of considerable trouble and expense. Just before the vintage began the vineyards had an exceptionally fine appearance. Vividly contrasting with the rest of the land, which was parched by an exceptionally dry summer, they were beautifully green and bearing a reasonably large crop of very perfect grapes completely free from all fungus diseases. I saw a few cases of Cochylis, but the damage was inconsiderable.

In the plain on the rich gravelly banks of the Dordogne I saw crops that would certainly yield 800 to 1,000 gallons to the acre, but this is, of course, distinctly the exception, and the wine resulting is of but very poor quality. Roughly speaking, if these exceptional spots are not considered, the average vine-grower will get a yield of between 250 to 300 gallons per acre. This would be above the average in the Médoc, and particularly so in many of the famous classed growths where high prices are always available. But speaking of the average grower who sells his wine new, unless he can get a crop bordering on 250 gallons on the average, his profits will be very small indeed. With working expenses, mounting up to nearly £6 per acre, and wine being worth but 6d. per gallon at first racking, the grower's lot is hardly an enviable one just now. Plenty of this season's wine has been sold on the vines for delivery immediately after vintage for 5d. per gallon, casks not included, for a red wine, very light of course, from an Australian stand-point, but quite marketable in France. White wines are worth a good deal more, but although I speak of actual sales representing the produce of perhaps 10 to 15 thousand acres the prices are really in a sense fictitious through growers being forced to sell almost at any price through the partial or complete failure of all other crops, in the vine-growing districts, from the drought.

The excessively low prices are by no means confined to any one district in France, but almost without exception they are caused by the intense cultivation of very heavy bearing varieties, which flood the market with most inferior wines so poor and thin that they must be consumed before they are twelve months old. When the advantages of reconstitution were realized, and prices were high, many growers aimed at quantity rather than quality, with the result that viticulture in France is passing

through such a crisis as has not been previously experienced. Every variety was planted that would yield large quantities, and even American fruit-bearing vines which make most objectionable wine through the peculiar, and, to many, repulsive flavour of the fruit. One grower was showing me his vineyard with pride, which was admirably cultivated, and asked me whether I had ever seen in Australia anything to equal it. Not wishing to hurt his feelings I told him I certainly never had, and inwardly hoped I never would, as more than half his vines were Othello, Herbemont and Jacquez. His wine was peculiarly repulsive, owing to an abnormal acidity and a very strong flavour, which the French call foxy. The choice of varieties is now as important for Victoria as it has been for France, and I cannot but urge growers most strongly to profit by the lesson now so visible of French viticulture, and keep only to the choicest varieties and increase the yield, first by the vigour of the American stock, and, secondly, by reasonable manuring and cultivation.

It would be waste of time for me to discourse at length upon the most successful European varieties and those most suited to Australian conditions, but I would like to mention that I have just driven through acres of Cabernet Sauvignon, bearing very large crops and yet having received no rain for over four months. The conditions this summer in France were so very similar to an Australian summer that if Cabernet can yield 300 gallons per acre with ordinary, and often by no means good culture, it is by no means a variety to be despised in Victoria. There is hardly a variety which is its equal for finesse and flavour, and it should take a foremost place with Shiraz and Malbec in future plantations. Of the two varieties of Cabernet common in Victoria there is so very little difference both in the quantity and quality of the fruit that they may be looked upon as variations rather than distinct varieties. I had the opportunity of tasting wines made separately from the Cabernet Franc and the Cabernet Sauvignon grown on the same vineyard and the difference was very small indeed. So small, in fact, that when I changed the glasses a well-known taster mistook one for the other. Of the white varieties I am still a believer in the Sémillion and Sauvignon, both imported a few years ago by me into Victoria. Of the other red varieties imported at the same time the Gamay should succeed in Victoria, but the coloured juiced varieties will all require to be tested carefully.

Perhaps more of interest would be some remarks upon how the different American stocks bear and particularly how they stand the drought. Contrary to usual experience in the South of France the Riparia Gloire is much appreciated in the Gironde, even on dry hill sides. This very much bears out our experience at the Viticultural College at Rutherglen, and as it is the most productive of all American varieties it will take a leading place in all rich soils. Riparia Glabre is entirely neglected as it is by no means as fruit bearing as the Gloire with the same disadvantages. Nothing can equal the favour of the hybrid 3309 for all dry climates. Almost as heavy-bearing as the Riparia Gloire, even in Algeria and the extreme South of France it is not affected by droughts. The 3306 can be classed under the same category, and although not quite so popular as the 3309, the only possible objection to it that I could hear of was that it does not strike so freely. The other Riparia and Rupestris hybrid most in favour is the 101^{14}. Really these three can be classed together for all practical purposes. Of the Rupestris the du Lot is the most popular, but there is a very strong feeling indeed against them now. As stocks, they produce vines of extraordinary vigour, but which have a tendency to run to wood

instead of to fruit, but the most serious objection to them of all is that they are not as long lived as the Riparia or Riparia Rupestris hybrids. When grafted on Riparia the European vine is always very much larger than the stock, yet at 25 years of age there is not the very slightest sign of failing. This is not the case with vines grafted on Rupestris, which through their extraordinary vigour during the first ten years seem to run themselves out and become unprofitable to cultivate, and even die before they are 20 years old. If this is not an absolutely general opinion it is certainly a very commonly expressed one, and as such should receive very serious consideration. This opinion is perhaps as much applied to the Metallica and the Martin as to the Rupestris du Lot, and it is very noticeable that neither of the first two varieties appears in any nurseryman's new catalogue. Putting these two varieties then out of the question for the moment particularly as one of them, the Martin, has already proved a failure in Victoria it would be of interest to briefly review the peculiarities of the Rupestris du Lot. First, I would refer to Messrs. Wilkinson and Dubois' excellent translation of Viala and Ravaz work on American vines. In it readers will find a carefully detailed description of each variety of American vine. In the first place Rupestris du Lot has a peculiar root system and its roots are very deep-sinking. It is for these reasons that it has been pre-eminently chosen for very dry land. Now it can be easily understood that this tendency of the roots towards deep-sinking may occasionally lead to difficulties where the subsoil is uncongenial to the vine. The main roots may work through the arable land and find themselves deprived of the nourishment which is necessary to them, or else the subsoil may be too moist to suit the peculiar requirements of the roots. During the first few years the roots are drawing upon the cultivated land and the vine is immensely vigorous, and later, if fresh surface roots are not continually thrown out, there is a lack of congenial sustenance and the vine suffers. I look upon this theory as being far more reasonable in explaining the short life of the grafted Rupestris than to put down the lack of longevity to the peculiarity of the vine in exhausting itself during its youth. Careful pruning would no doubt enable the Rupestris grafts to be prolific, but on the average the fruit does not set quite as well as upon vines grafted on the hybrids and on Riparia unless when grown upon the very poorest and stoniest soils. Confining then the above arguments to Victorian conditions, Rupestris du Lot should be planted on the dry hill tops, the hybrids on the slopes and the Riparia Gloire on the flats. Rupestris Metallica should be classed as perhaps second to Rupestris du Lot for the driest stony ridges as it has already shown signs of becoming well acclimatized in Victoria. Rupestris Ganzin is now entirely neglected except in its hybridized form as Aramon x Rup. Ganzin. This variety and the 1202 Mourvedre x Rupestris are much cultivated and appear absolutely resistant to phylloxera. They are largely used as stocks for Muscats and other spongy, pithy wooded varieties which are grafted with difficulty. They are most prolific and so far have shown every sign of longevity. For all ordinary conditions then these two varieties can be safely used, and particularly for the drying sorts. Coming to the question of affinity. The ordinary wine-making varieties offer no difficulties at all. Usually the firmer the wood and the denser the tissue the better the strike. Gordos and Muscats and also Zante currants have been as yet but little grafted in France, but their lack of affinity with the American vine is well recognised. This lack of affinity is due to the wood being very spongy and pithy, and to lessen this difficulty it would be as well to grow vines

specially for scions. The vines should be pruned well back and no grapes or laterals allowed to grow, the ends of the shoots to be nipped off so as to assist the perfect maturing of the wood. Much in fact as has been done in growing American stocks at the Rutherglen College.

As for grafting methods there is but little to be learned in the Gironde. Grafting machines are nor very extensively used, as labour is cheap and the simple cleft graft is more popular than any other, largely on account of the union being more easily discernible, when imperfect, than with the whip-tongue graft. With the latter the two tongues may not unite completely and the vine will suffer eventually through having scars, so to speak, at the point of union. One nurseryman told me he had discarded machines as the cut was never clean as with a knife, and the strike in consequence suffered. The machine must be very perfectly adjusted and the knife kept absolutely sharp in order that a satisfactory result may be obtained. In callusing the grafts, many nurserymen use no ligatures at all. The grafts are carried direct from the bench to the callusing beds and there placed in position and kept until callused. Usually they are not taken from the callusing beds until much later than has been possible at the Rutherglen nursery, water shoots being cut off carefully and the grafted vine planted in the nursery. Here comes in the chief difference between French and Victorian methods. No nurseryman will attempt to strike vines unless in most suitable free sandy soil. They insist upon the soil being sufficiently sandy to be worked in all weathers and would no more dream of trying to strike vines in a stiff clay soil as at the Rutherglen College than a Ballarat farmer would try to grow pineapples instead of potatoes. Suitable nursery land is the very first consideration and fetches high prices. It must be sufficiently free for the vines to be planted when they are actually callused. The callusing must not be hurried for fear of the land setting and becoming unworkable. The soil must never crack, but more especially must there never be any hard lumps which may touch the graft and disturb it during disrooting and hoeing. When I described the soil of the Rutherglen nursery I was at once pitied for having had to live in such a wretched country where even the nursery land would not even grow potatoes. It is my opinion, which I have often expressed before, that if reconstitution is to be carried on successfully in Victoria the Government nursery should be specially chosen for the purpose. So long as unsuitable land is used so long will the results be inadequate and unremunerative. One Victorian grower, as full of enterprise as ever, tells me that he is starting a nursery on Murray River flats where he has suitable soil and water handy. There is surely no reason why with the land at their disposal the Victorian Department of Agriculture should not find a spot more suitable for growing grafts than the land now used at the Rutherglen College within a get-at-able distance of the present grafting and callusing plant.*

I was particularly interested in hearing the percentage of strike is seldom above 40 per cent., and when above that it is put down to the richness and friability of the soil. This year as there was no rain for four months and irrigation was scarcely considered necessary or provided for the average strike will not exceed 30 per cent. From these figures it will be seen that Victoria has not a great deal to learn from France in the matter of grafting methods, except in the matter of the choice of soil,

* A suitable block has now been secured as a nursery at Wahgunyah.—Editor.

and that in the choice of varieties the chief points of interest may be summarized as follows:—

1. 3309, 3306, 101[14], for all average soils.
2. Rupestris du Lot and Metallica, for all dry soils.
3. Riparia Gloire, for all moist soils and ordinary flats.
4. 1202 and Aramon x Ganzin, for all average soils for drying varieties.

This choice is really the recommendation of the very best to the exclusion of all others based upon the fruit-bearing qualities of the vine when grafted, its longevity, affinity and adaptation. I have not considered limestone soils as they are uncommon in Victoria. All wine-making varieties will take equally well with any of the above-mentioned American varieties, and their affinity seems to all intents and purposes the same, if only the Muscats are excepted, for which the American and Vinifera hybrids are to be recommended. These, although only half American, have so far in France shown complete resistance to phylloxera, which fact will by now be amply demonstrated in the plantations at the Rutherglen College.

Much has been said concerning the grafting affecting the quality of the fruit, and nearly 30 years' experience in the Gironde has conclusively proved that, given the same treatment, the grafted vines will produce wines of quite equal quality to ungrafted vines. The opinions commonly expressed in France of the deterioration of the French wines is as unjust as it is erroneous. Certainly there is a general deterioration in the quality of the common types of wine in the Gironde, but that is not due to the American resistant roots, but to the use of inferior fruit-bearing scions. Large areas have been planted in very heavy-bearing varieties which can, whether grafted or ungrafted, never produce wines of any class. Also American fruit-bearing varieties have been mixed with the others and the quality of the whole contaminated. Where, however, only the best varieties have been grafted, Cabernet, Merlot, Malbec, Verdot, &c., the quality of the wine is every bit as good, if not better, than what was made from the original European vines. I was able to taste two white wines made in 1900 from adjoining blocks in the same vineyard, one from the old vines which had been saved from phylloxera, and the other from vines grafted in 1884 from cuttings of these upon American roots. Any difference that did exist was entirely in favour of the wine from the grafted vines, which appeared to be slightly more flavoured and softer than the wine from the old vines. The alcoholic strength was the same, although the grafted vines gave a yield one-third greater than those ungrafted. The tendency is always to increase the yield, and largely for this reason I cannot too strongly impress upon growers the necessity of using only the very best wine-making varieties. Common poor wines there are in plenty, but good quality wines will always command a ready sale at remunerative prices to the grower.

Having strongly recommended the importation of grafted vines from France to Australia I naturally made all possible inquiries concerning the export of grafted vines from France to other countries. The general opinion of growers was that with ordinary care in disinfection there can be no possible reason why grafted rooted vines should not be sent from France to phylloxerated areas. In France growers will buy and have bought from nurseries infested with Black Rot, Oidium, Mildew, Cochylis, &c., and planted the vines among their own healthy vines without there being any contamination from these diseases. Vines have been sent from

France to Roumania, Greece, Switzerland, Portugal, Spain, Chili, Peru, Madagascar, &c., and ordinary disinfection is considered amply sufficient. This is not the opinion of nurserymen who would, of course, be biased, but of thoroughly competent vine-growers having a thorough knowledge of vine diseases in all their phases and whose personal interest the success or otherwise of Australian vineyards could not affect.

THE ORCHARD.

James Lang, Harcourt.

By the end of the month, most of the fruit, even in the latest districts, will be gathered. The crops of all kinds of fruit have been unusually heavy this season with the result that prices have been kept at a very low level throughout the whole of the States, leaving a very small margin of profit after expenses were paid.

Where it is intended to sow peas for green manuring the orchard, the work should be taken in hand at once. The ploughing and sowing should be done as early in the month as possible, in order that the peas may have a good start before the cold weather sets in; this is most important, because, if delayed until June, the weather is so cold and damp that several weeks elapse before they come through the ground, and subsequent growth during winter is also slow. When sowing, superphosphate should be applied at the rate of 2 cwt. per acre. In cases where it is intended to extend the orchard, the ground should be prepared by ploughing to a depth of at least 8 inches and scarifying well in order to reduce it to a fine tilth.

Advantage should be taken of a slack time to do odd jobs about the orchard, such as repairing fences, cleaning out drains and the outlets of underground drains. The silt and rubbish removed from the drains should be fully utilized by the orchardist, as they make good manure; surface scrapings and soil from odd corners form valuable additions to the soil of the orchard. Where good virgin loam can be obtained, it makes a splendid dressing, and is very lasting in its effects.

Remove the codlin moth bandages from the trees, and well scald them to destroy any grubs that may be harboring in them; then dry carefully and put away until next season. In order to reduce the number of hiding places for the grubs, the trees should be well scraped, all loose bark taken off and burnt, and the holes and cracks stopped up with putty.

The export of apples and pears this season has been a record one from this State, about 130,000 cases having been shipped to England and Germany. This is double the quantity of any previous season, and should the prices realized be good, a great impetus will be given to the export trade in apples. It is also to be noted that New South Wales and Western Australia have both entered the export trade this season for the first time, showing that these States will soon be able to supply their own requirements, and so further limit the outlet for Victorian fruit. A large quantity of pears has been shipped this season, and it is to be hoped that the consignments will arrive in better condition than they have hitherto done, as there is no reason why pears should not carry as well as apples.

Orchardists should bear in mind that the new Fruit Case Act comes into operation on the first of July. All fruit sold by the case must be packed in bushel or half-bushel cases; where other sized cases are used the net weight of the contents must be marked on the outside.

STATISTICS.

Rainfall in Victoria.

FIRST QUARTER, 1907.

TABLE showing average amount of rainfall in each of the 26 Basins or Regions constituting the State of Victoria for each month and the quarter, with corresponding monthly and quarterly averages for each Basin deduced from all available records to date.

Basin.	January.		February.		March.		Total for First Quarter.*	Average for First Quarter.
	Amount, 1907.	Average.	Amount, 1907.	Average.	Amount, 1907.*	Average.		
Glenelg and Wannon Rivers	0.66	1.51	0.69	0.77	0.96	1.55	2.31	3.83
Fitzroy, Eumerella, and Merri Rivers	0.80	1.64	0.41	0.89	0.86	1.82	2.07	4.35
Hopkins River and Mount Emu Creek	0.78	1.72	0.86	1.05	0.73	1.84	2.37	4.61
Mount Elephant and Lake Corangamite	0.99	1.79	0.66	1.16	1.11	1.86	2.76	4.81
Otway Forest	1.24	3.29	0.66	1.66	1.43	3.22	3.33	8.17
Moorabool and Barwon Rivers	0.40	1.57	0.67	1.22	0.91	1.55	1.98	4.34
Werribee and Saltwater Rivers	0.77	1.67	0.71	1.58	0.87	2.00	2.35	5.25
Yarra River and Dandenong Creek	0.86	2.79	0.96	1.70	1.46	2.44	3.28	6.93
Koo-wee-rup Swamp ...	0.54	2.71	0.82	1.39	1.69	2.21	3.05	6.31
South Gippsland	0.40	2.77	0.82	2.12	2.01	2.47	3.32	7.36
La Trobe and Thomson Rivers	0.52	3.05	0.75	1.92	1.93	2.33	3.20	7.30
Macallister and Avon Rivers	0.61	2.25	0.56	2.28	0.88	1.47	2.05	6.00
Mitchell River	0.98	2.79	0.73	2.94	1.15	1.49	2.86	7.22
Tambo and Nicholson Rivers	1.36	2.88	0.67	2.62	0.92	1.37	2.95	6.87
Snowy River	1.91	3.26	0.65	2.75	1.57	2.11	4.13	8.12
Murray River	0.70	1.31	0.64	1.37	0.87	1.68	2.21	4.36
Mitta Mitta and Kiewa Rivers	1.98	2.01	0.65	2.47	1.16	2.46	3.79	6.94
Ovens River	0.91	2.32	0.81	2.37	1.74	2.37	3.46	7.06
Goulburn River	0.75	1.49	0.85	1.29	1.23	1.65	2.83	4.43
Campaspe River	0.71	1.32	1.31	1.13	0.72	1.86	2.74	4.31
Loddon River	0.29	1.10	1.30	0.91	0.51	1.30	2.10	3.31
Avon and Richardson Rivers	0.08	0.92	1.09	0.69	0.28	0.96	1.45	2.57
Avoca River	0.05	0.91	1.19	0.67	0.42	1.17	1.66	2.75
Western Wimmera	0.19	0.99	1.13	0.52	0.38	0.94	1.70	2.45
Eastern Wimmera	0.15	1.25	0.96	0.68	0.51	1.18	1.62	3.09
Mallee Country	0.01	0.88	0.69	0.76	0.14	0.87	0.84	2.51
The whole State	0.60	1.67	0.81	1.32	1.05	1.58	2.46	4.57

* Figures in these columns are subject to alterations when the complete number of returns for *March has been received.*

P. BARACCHI,
Government Astronomer.

Perishable and Frozen Produce.

QUARTERS ENDED 31ST MARCH, 1907 AND 1906.

Description of Produce.		Exports from the State.		Deliveries from the Government Cool Stores.	
		1907.	1906.	1907.	1906.
Butter	lbs.	15,895,132	12,018,622	11,422,433	8,415,288
Cheese	"	301,680	211,200	46,660	20,543
Ham and Bacon .	"	702,240	629,520	...	...
Milk and Cream ...	cases	7,742	3,923	1,137	383
Poultry	head	13,590	15,570	3,285	4,109
Eggs...	dozen	6,480	6,390	17,013	16,066
Mutton and Lamb	carcasses	256,011	251,105	62,971	56,501
Beef	quarters	1,825	2,598	295	...
Veal	carcasses	877	1,279	...	..
Pork...	"	778	2,456	364	844
Rabbits and Hares ...	pairs	510,960	1,037,364	304,302	508,474
Fruit	cases	127,513	66,182	7,861	541
" Pulp	"	973	1,774	..	..
Sundries	lbs.	...	...	16,581	10,123

R. CROWE,
Superintendent of Exports.

Fruit, Plants, Bulbs, Grain, &c.

IMPORTS AND EXPORTS INSPECTED DURING QUARTER ENDED 31ST MARCH, 1907.

Goods.	Imports.		Exports.		Goods.	Imports.		Exports.	
	Inter-State.	Over-sea.	Inter-State.	Over-sea.		Inter-State.	Over-sea.	Inter-State.	Over-sea.
Apples ...	133	—	912	92,571	Quinces ..	6	—	23	—
Apricots ..	30	—	4,471	60	Tomatoes	504	—	1,171	81
Bananas, b/s.	116,091	—	—	—	Plants ...	76	200	6	14
Bananas, c/s.	4,174	205	1,251	68	Bulbs ...	9	232	2	—
Blackberries	518	—	1	—	Barley ...	26,389	7,432	—	—
Blk. currants	3,166	—	—	—	Beans ..	158	24	—	—
Cherries ...	—	—	772	623	Turnips	42	—	—	—
Cucumbers	49	—	89	—	Nuts ...	—	558	—	—
Grapes ...	390	—	961	—	Nutmegs	—	219	—	—
Lemons ...	193	104,462	288	66	Oats ...	2,590	4	—	—
Melons ...	733	—	17	—	Peas ...	142	25	—	—
Mixed fruits	76	1,794	27	2,237	Potatoes	2,981	184	—	—
Nectarines	—	—	139	—	Rice ..	—	42,178	—	—
Oranges ...	249	7,880	23[illegible]	5	Seeds ..	3,803	9,116	—	—
Passion fruit	2,116	—	28	2	Wheat ..	—	1	—	—
Peaches ...	32	—	3,151	144	Cnd. fruits	—	—	—	2,261
Pears ...	130	—	2,589	9,386	Jams ...	—	—	—	743
Persimmons	139	—	1	—	Drd. fruits	—	2,586	—	285
Pineapples	18,703	—	185	162					
Plums ...	3	—	688	162	Total ...	184,626	177,100	17,007	108,870

Total number of packages inspected = 487,603.

J. G. TURNER,
Inspector under the Commerce and Vegetation Diseases Acts.

THE JOURNAL

OF

The Department of Agriculture.

Vol. V. Part 7. 8th July, 1907.

FRUIT EXPORT SEASON 1907.

J. G. Turner, Inspector under Commerce Act.

The fruit export season just concluded has been chiefly remarkable for the great increase in the quantity exported. The total quantity shipped through this season, to date, amounts to 131,083 cases of apples and 5,017 pears, as against an output of 49,580 cases of apples and 2,486 cases of pears for last season. This represents an increase of 161 per cent. Taking the history of this industry for the last eight years we find that in the first year of that period only 11,000 cases were exported as

A STRING OF TRUCKS.

13,000 cases of fruit are represented here.

against the abovementioned figures for the present season, showing a magnificent and encouraging increase of over 1,100 per cent. Another point to be considered is that in addition to the export of green fruits a new development has come about in the export of dried fruits. Prior to this season little or no dried fruit was exported from this State excepting small lots for inter-state trade. For this season the figures are likely to rival in point of average yearly quantity those representing the green fruit trade. Viewing these two departments of the fruit trade as a whole the increase

t the total quantity exported bids fair to amount to no less than 2,000 per ent. on the quantity exported in 1900.

The whole of the fruit shipped for this season was exported under he provisions of the newly instituted Commerce Act. Despite the gloomy redictions of most of those concerned in the industry the regulations were found to be easily workable. The Victorian output has been, in every instance, dealt with under Form 2 (Request to Certify and Mark with an Approved Stamp). The method of dealing with goods for export s left to the exporter. If he choose he may send his goods away under in Export Permit. The latter method has been unanimously adopted in South Australia and Tasmania, but the Victorian growers have found hat the uniform excellence of their goods, combined with the application of the official stamp of approval, has done so much to enhance their profits that they were loth to abandon the benefits accruing under the old system.

SORTING A MIXED TRUCK.

When the Commerce Regulations came into operation with provision for official stamping of packages it was feared that the stamping and its accompanying examination of the goods would entail much extra handling and consequent damage. Shippers therefore decided to ship under the Export Permit as was being done in other States. It was found, however, on the morning of the first shipment of the season, that their fears were groundless—the fruit was received, examined and despatched with less handling than was necessary in previous years. The growers and agents were quick to grasp the possibilities afforded by the storage accommodation provided by the Department and a reaction set in. From that hour every shipment was dealt with under the system of certification and stamping.

In order to cope with the work involved in this system the Department of Agriculture has secured the lease of a commodious shed at Port Melbourne capable of containing many thousands of cases. The floor-space

has been found to be a great advantage to those shippers who, after forwarding their goods to the Port, have discovered that no vessel was available owing to changes in the time-table &c. By arrangement with the Department the whole of their fruit was run into the shed and carefully stowed away from weather, pillage, damage &c.; it was also found that the system did away with the costly demurrage charges which otherwise would have been imposed by the Railways Department for the delaying of the trucks pending the arrival of the steamers. The greatest of care was exercised by the Departmental officers in seeing that fruit, although in many cases wrongly marked or badly mixed in the trucks, was properly sorted and branded; a watchman was told off to guard the fruit at night and agents were promptly notified of any shortages or incorrect markings and other faults. The result of all this was that most of those who "came to scoff" at the new system were the first to come forward and acknowledge its advantages.

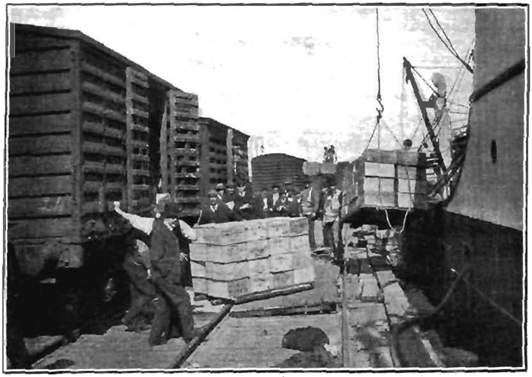
The quality of the fruit was, on the whole, far in advance of previous years. Very little was condemned by the inspectors and in every instance Bitter Pit was the offending disease. This defect was more noticeable in the Cox's Orange Pippins sent forward, Cleopatras coming second. The Jonathans showed up very favorably except that here and there a form of disease known to growers as Skin Pit was in evidence. With regard to Cleopatra and Cox's Orange Pippin varieties, growers will do well to remember that in forwarding extra care should be taken that large sizes are excluded, for, in nearly every instance where the inspectors had to reject these varieties, the grower asserted that at the time of packing there *was no noticeable trace whatever of the disease. In spite of that, however,* the larger fruits almost invariably showed up badly in this respect. A hard medium sized apple should be the standard. With regard to Codlin Moth, very little was noticed; the same applies to scab and other diseases. One of the best all round varieties in point of freedom from disease was Munroe's Favorite. This apple has been exceptionally good during the past season.

The cases used gave more satisfaction than those used in previous years. The compulsory marking of the words "One Bushel" demanded that cases should approach something like uniformity, and this, coupled with the knowledge that the new Victorian Fruit Cases Act would come into operation on the 1st July, 1907, tended to bring about the desired uniformity. This Act is designed more particularly to deal with export: the case prescribed is slightly larger than that set out by the Commonwealth Government, containing as it does 2,236½ cubic inches as against 2,218 cubic inches in the case recommended by the Commonwealth authorities. This should insure good weights in every package and should do away with any cause for complaint from foreign markets in future.

Among various faults noticed in shipments, one stands out prominently and that is the use of soiled wrapping-paper and newspaper shavings for padding. The practice cannot be too strongly condemned. The aim of every grower should be to put up his goods in as attractive a manner as possible. It is recommended that in place of newspaper packing only clean, white paper shavings, cork shavings, or wood-wool be used. All ragged edges should be clipped off after the case is nailed down. Loose packing must also be strictly avoided as a loosely-packed case does not contain the full bushel demanded by the law. Growers will do well to bear in mind that the inspectors are provided with a set of weighing

machines, foot-rules &c. in order to check any attempt at short weights and measurements. Another thing to be remembered is that such shortcomings only involve extra delay, more handling and vexation to the city agent, who, often at the last moment, is called upon to correct the errors of his client.

In the illustration on page 386 the discharge of a fruit-truck into the shed is shown. It must not be inferred from this picture that every truck arriving at the shed has to be discharged for examination as is here shown. The extra and really unnecessary handling is compulsory in this instance for two reasons. The first is that most of the growers will insist on stacking their export pears in the furthermost corner of the truck; the second, that fruit for two, or even three, steamers is sometimes stowed in the one truck. With regard to the first reason, it is necessary to explain that when a truck reaches the steamer's side all pears



AT THE SHIP'S SIDE.
Improved square slings in use.

are retained and put aboard last of all. After the apples are taken out the pears remain in the trucks and are shunted up and down the pier until perhaps the next day. Under the new system this is all avoided. Pears are carefully taken out immediately on arrival at Port Melbourne and stored in the shed under lock and key for the night. Thus it will be seen that if pears are stacked by the growers so that when the door of the truck is opened, the inspectors and staff may take them out at once without having first to remove some hundreds of cases of apples, and much unnecessary handling will be avoided. The reason why pears must be separated and loaded last is that they are usually carried at a lower temperature than apples, and therefore must be placed in that portion of the vessel's hold set apart for them. With regard to the second reason as to why trucks have sometimes to be emptied, it has been found that many growers (no doubt from motives of economy or expediency) are in the

habit of stacking in the same truck several lots of fruit intended for consignment by different boats. When it is considered that often some of these boats are not yet in port when the fruit arrives at the pier the necessity for the removal of the fruit into a place of safety is apparent. To sum up; stack all pears immediately in front of the doors of the trucks and do not mix lots for different steamers in the same truck.

Another point to which I have referred in previous articles is that, when possible, "louvre" trucks should always be used. This truck is known to railway men as a "U" truck. Failing these an "H" truck should be used, but on no account should fruit be stacked in open trucks (usually covered with tarpaulins) except in cool weather, as the tarpaulin draws the heat of the sun and converts the truck into a veritable hot-air chamber. It was also noticed that through the tarpaulins being damaged or worn through, some of the fruit was wet when examined.

The use of the word "sound" on cases containing fruit which landed in London in a rotten condition has occasioned a good deal of comment. Unless the fruit is being shipped under the Export Permit beforementioned there is no necessity to apply the word "sound." As the whole of last season's shipments was examined, certified, and stamped by the officials it is safe to assume that next year's procedure will be the same; if so, growers need not stamp their cases with the word above referred to.

CHICKEN POX.

H. V. Hawkins, Poultry Expert.

Numerous inquiries are reaching me concerning a disease not uncommon at this time of year—*Poultry Favus*—or what is usually known amongst poultry keepers as Chicken Pox. As the outbreak this year is apparently so widespread, it would appear opportune to briefly describe the symptoms and methods of treatment, as by neglecting the disease in its early stages the birds become emaciated and fail to respond to treatment.

One of the principal causes of this complaint is that of over-crowding in damp or filthy runs and houses. The disease usually attacks young birds, especially those hatched late. It rarely affects adult birds; and the breeds which are most subject to it are:—The Cochin, Brahma, Orpington and Wyandotte, and very often those breeds which carry heavy combs, such as the Leghorn, Minorca, and Dorking. Many fine specimens of the latter breeds lose the tip of the spike, especially if the affected birds are not hobbled. The disease is one that greatly irritates, and the more the birds scratch the parts affected, the more rapidly do the spores spread, until the birds become a mass of sores, or, what appears to the casual observer, warts. The first symptoms which every amateur may detect are loss of appetite and a great thirst. The birds should at once be isolated and allowed no water for two days at least, and be given only soft food (pollard and bran moistened with skim milk) and plenty of finely cut raw onion.

Minute, pale yellowish spots, cup like but irregular in form, appear on the comb, often on the wattles and at times on the eyelids. The latter are the most troublesome to deal with, and it is absolutely necessary that the birds should be hobbled. This can be done by tying a piece of tape around the ankle—the joint just above the foot, and below the fourth

toe—except those breeds having five toes such as the Faverolle, Dorking and Houdan breeds; in these cases the tying should be between fourth and fifth toes so as to prevent the tape slipping up the shank.

Remedy.—Bathe the head and face with a weak solution of permanganate of potash. Make a paste of the following and apply to all parts affected:—*Sufficient sulphur to fill a small pill box, enough boracic acid that will go on a threepenny-piece and five drops of eucalyptus oil with sufficient soft soap or vaseline to make a paste, mix thoroughly together* and apply with a small camel hair brush. Do not allow the hands if cut or scratched to come in contact with the crusty wart. A good and safe preventive from contagion is to use an antiseptic, consisting of either a 3 per cent. solution of phenyle or lysol, in which the hands should be rinsed. All houses should be thoroughly fumigated with burnt sulphur and floors sprinkled with lime. With care there need be little to fear, but children should on no account be allowed to handle the fowls so affected, neither should any person with an injured finger, as the disease is far from pleasant. The irritation and sudden sickness which follow are most distressing. Four to five days will effect a cure when it will be seen that the crusts will fall off and the birds' appetites will return. A tonic in the water should at once be given viz.:—*To 2 gallons of water add 80 to 90 drops of sulphuric acid (poison) and 1½ to 2 ozs. of sulphate of iron*; allow same to remain a few hours, after which stir well and give all the birds on the farm as much as they will readily drink. This will prevent the disease spreading and will tone up the flock.

Although the complaint is not serious, yet if neglected it is sure to turn to that dreaded disease—roup—attacks of which are more often fatal than any other ailment of poultry in Australia. Damp houses are the primary cause; crowded yards, such as are often noticeable in our suburban areas, are also responsible for serious complaints, especially at this time of year. I would again remind cottagers of the absolute necessity of sweeping up the droppings daily and of the urgent necessity of sprinkling lime about the yards; not more than twenty birds should be kept in a yard of less than 50 x 25 at least, the more crowded they are the less profitable will they become. Remember, that a few good birds of a noted laying strain will return a greater number of eggs than a large flock kept together. This has been exemplified over and over again, at the egg-laying competitions throughout Australia. To those desirous of keeping a few birds to supply the requisite morning egg, I cannot do better than urge them to secure a broody hen as soon as possible, and thus secure the early chick and immunity from chicken pox.

DAIRY PRODUCE EXPORT TRADE.*

R. Crowe, Superintendent of Exports.

LEADING FEATURES.

Victoria the Principal Dairying Country in the Southern Hemisphere. 701,309 Dairy Cows in Victoria, an Increase of 52,200, or 8 per cent. for the Year.

Milk Production, over 200,000,000 gallons.

Butter Production, 33,611 tons. Cheese Production, 1,918 tons.

Export of Butter, 20,883 tons from 1st July, 1906, to date (10½ months). Increase, 2,743 tons as compared with the total for last Season.

Distinct Improvement in Quality. Steps to prevent Butter Faking.

SUGGESTIONS.

Further Improvement in Breeding, Feeding, and Management. Unremitting Cleanliness.

Local and Export Butter to be Separately Branded. Churn Marks to go on Boxes.

Adoption of Grading with Brands Masked. Raising the Minimum Points for the Grade "First Class" from 86 to 88 Points.

The season 1906-7 now approaching a close has been the best for dairying ever experienced in Victoria. A fair beginning was made in August-September last, production during the spring and early summer reaching a higher level than ever.

The growing popularity of dairying is evidenced by the fact that the number of dairy cows has increased during the last twelve months by 52,200, the total now being 701,309, a gain of 8 per cent., whilst the average yield has also improved. The latest statistics for 1905 show an average of 328 gallons per head, a comparatively low yield for the length of time our dairymen have been engaged in the business; it should be at least 25 or 30 per cent. more. However, the fact that they have made money at dairying despite the competition of other countries indicates that, when the stress of fight is felt, our latent resources will be drawn upon to balance matters and they will be as well off in the near future even though prices may be lower than the abnormally high values obtained hitherto.

The exports from the 1st July 1906 to date are nearly 25 per cent. more than for the corresponding period of last season. For many years past I have held that in competition with other countries Victoria's future success in dairying depends mainly upon a policy of development, the cheapening of production, and the continual improvement in breed and

* Paper read at the Fourteenth Annual Conference of the Australasian Butter Factories Managers' Association, held May, 1907, at Melbourne.

intelligent and progressive methods of feeding, rugging, winter shelter, and general treatment.

The marked falling off in supplies after the month of March shows that to a lamentable extent our dairy farmers have done very little to prolong the period of lactation by conserving the surplus growths of spring in the shape of ensilage, or hay, or by cultivating green summer fodders such as maize and sorghum, or autumn root crops, mangolds, beet, &c. Those who could show that they had honestly attempted to grow or provide summer fodder but had failed for the want of rain would deserve sympathy, but the striking and successful exceptions to be met with in every district only serve to point and emphasize the moral.

The yield of maize, cabbage, or other fodder is of course not so heavy as in favorable seasons but still from two-thirds to three-fourths full crop is not uncommon and those who secure it not only maintain the flow of milk but—what is of far greater importance—preserve the health and condition of their cattle so that they may weather the winter successfully, and enter the new season in full profit. This matter demands earnest and immediate attention. At the moment it is regrettable to hear of dairy cattle in certain places dying of starvation and it is well worthy of consideration whether the recent suggestion of a friend of mine that "any man permitting cows to starve should be punished for cruelty to animals" should not be adopted.

FOUNDATION OF SUCCESSFUL DAIRYING.

A consistent system of testing individual cows in each herd by weighing and recording yields is the foundation of success and every dairyman who has done this has succeeded far beyond his most sanguine expectations. The Government Statist's return for 1899 indicates that records were supplied him from 164,238 cows whilst in the year 1905 returns for only 75,727 cows were made available. It would appear therefore that the practice of definitely recording the quantity and quality of milk given by herds is declining notwithstanding the Agricultural Department's constant recommendations to the contrary. It is remarkable that the second highest average return is recorded in the Gunbower district where there is an annual average rainfall of about 12 inches only; this good return is no doubt largely due to the adoption of irrigation in the district referred to. Absolutely the lowest returns are those from the counties of Tambo and Follett where a rainfall of 30 and 25 inches respectively is recorded. Our climate would therefore appear to be too favorable in one respect and not severe enough in another. Were either regular periods of drought or severely cold winters the rule, people would be compelled to conserve fodder or grow summer or winter crops and provide shelter in order to carry on at all.

The total production of butter in Victoria for the season is approximately 75,288,640 lbs. or 33,611 tons worth £3,500,000, of which 20,883 tons exported, at 100s. per cwt. c.i.f., realized £2,088,300.

The cheese production for the last year was 4,297,350 lbs. or 1,918 tons, worth £107,433, of which £26,896 worth was exported.

The milk produced for consumption in the natural state and concentration amounted to 30,633,130 gallons or £733,418 in value of which £36,142 worth was exported.

The value of milk, butter and cheese produced totalled £4,340,851, and the portion exported realized, including expense of conveying to market, £2,151,338.

Including pig and poultry products (ham and eggs come under the heading of dairy produce) which for the year are valued at £2,469,214, the grand total production for the year reached £6,810,065. That this estimate of production is below the mark is evident. It takes about one gallon of milk to make one pound of cheese and two and one-third gallons for a pound of butter. The total yield of milk on this basis will amount to 208,205,311 gallons whereas if the number of cows be multiplied by the average yield given for those returned for 1905, the result will reach over 230,000,000 gallons. Unlike exports, it is impossible to secure an absolutely correct estimate of the production, but those two results are arrived at from data procured from different sources. The industry next in importance to the State is grain, with production under £5,000,000, meat and wool following with less than £4,000,000 each and gold slightly over £3,000,000.

Victoria ships about half the butter exported from the Commonwealth and about 25 per cent. more than New Zealand. Last year New Zealand exported 8,145 tons of cheese at a value considerably in advance of that ruling for butter. However, combining butter and cheese returns, Victoria has still a good lead as *the principal dairying country in the Southern Hemisphere.*

WHERE THE BUTTER IS PRODUCED.

It is interesting to note which portion of the State is making the greatest headway in dairying. The following table shows the arrivals (including butter ex cream estimated at 40 per cent.) in Melbourne by rail and steamer for the last five years:—

Name of District.	1902.	1903.	1904.	1905.	1906.
	lbs.	lbs.	lbs.	lbs.	lbs.
Western and North-Western	10,715,040	14,169,120	16,764,160	15,655,360	19,449.920
North-Eastern	5 305,440	7,035,840	10,731,840	10,428,320	13.224.960
Northern	1,402,240	1,999,200	5,139,680	6,292,600	8,395.520
Gippsland	13,254 080	15,051,120	18,449,760	17,120.320	19,063 520
Grand Totals ...	30,676,800	38,255,280	51,085,440	49,496,600	60,133.920

Of course 1902 will be remembered as the drought year when production was at a low level, although Gippsland and the Western District were not affected to anything like the same extent as the North and North-Eastern District. The 1906 returns show that the Western District's contribution has practically doubled, the Gippsland returns have increased by over 50 per cent., whilst the North and North-East combined gained three and a half times as much, leading each of the other two districts for last year by 2,000 tons.

GROWTH OF EXPORTS.

The exports for 1902 to all destinations were 15,052,551 lbs. and in 1906 they reached 46,012,002 lbs. a three-fold gain during the five years. The United Kingdom serves as the great safety valve by taking our surplus shipments, some thirty-three and a half million pounds in 1906. The shipments to South Africa and eastern and other ports are on a steady

Destination.	1902.	1903.	1904.	1905.	1906.
	lbs.	lbs.	lbs.	lbs.	lbs.
United Kingdom ...	1,394,276	15,908,342	28,950,187	25,935,310	33,412,996
South Africa... ...	3,825,085	3,554,560	3,962,181	3,[illegible]49,664	3,771,796
Inter-State	9,090,517	7,735,601	3,729,928	5,527,420	7,517,408
Eastern and other Ports	742,673	1,181,378	1,305,920	1,104,814	1,309,802
Grand Totals ...	15,052,551	28,379,881	37,948,216	35,917,208	46,012,002

level and average about 5,000,000 lbs. whilst the inter-state trade, which showed a decline during the first two years, is reviving and has doubled within the last three years. It is not generally recognised that *Victoria has a regular export trade to destinations other than Great Britain which amounted last season to 5,625 tons*, equalling more than the whole of Queensland's shipments to the United Kingdom even during her present most prosperous season. Some idea of the ramifications of the trade may be gained from the fact that 540 complete shipments were made from Victoria during the last twelve months of which 212 were to the United Kingdom and other oversea ports and 328 inter-state.

QUALITY OF BUTTER.

It is most pleasing to have to record a distinct improvement in the quality of Victorian butter for the season as compared with either the last or the year before. The highest average score was 98.36 points against 97.98 for 1905-6 and 97.64 for 1904-5. Twelve factories scored over 97 points as against nine factories last season and six for 1904-5. One hundred and fifty-five scored an average of over 90 points against 132 for 1905-6 and 116 for 1904-5. During the month of October last, over 40 per cent. of the butter shipped to Great Britain was unsalted and the proportion for the whole of the season amounted to nearly 34 per cent. For the first time weekly statements which were highly appreciated by the trade were published by the Department showing the proportion of salted and unsalted, so that the quantity of unsalted might be regulated.

PRICES.

The prices realized on the London market were not as high as for the preceding season. Although the highest touched 122s. per cwt. the great bulk brought about 100s. The best average so far available was 104s. 9d. therefore we are rather below the mark in fixing it at 100s.

COMMERCE REGULATIONS AND GRADING.

The Commerce Regulations came into operation on the 1st October 1906 and the consequent stupendous re-organization they entailed, nearly every brand in use having to be remodelled, has been effected with a minimum of friction. Although grading is optional, the classification, and the issue of grade certificates have become so popular that less than 1 per cent. of the butter shipped since the coming into operation of the Act has been unclassified. Almost all the shippers have taken advantage of the voluntary classification system and have had their butter graded and branded with the grade certification number; in addition over 30 per cent. of the exporters have had their butter grade-stamped with the words

"First class superfine," "First class," or "Second class," as the case may be. Owing to the late beginning and the large quantity of butter coming forward for export and the extent to which the classification section has been availed of, the Department was unable through being undermanned to put into operation clause 17:—

"The exporters shall give to the officer any information desired by him as to the date of churning of any butter . . . submitted to him for inspection."

Needless to say this section will be enforced in the future.

Hitherto, the practice has been to select three boxes from each brand at random. It can easily be understood that samples so selected may not in some instances be truly representative. As far as possible the brands were hidden from the graders but in the height of the season with a limited staff this procedure could not be invariably followed, and when it is stated that as many as 12,000 boxes of butter were received in a single day the difficulty of so doing can be appreciated. It is intended to have all brands hidden from the graders in future by having tin covers fitting neatly over each sample box with a 2-inch hole in the centre for the trier. These covers will be numbered and the graders will only recognise a box by its number, a clerk afterwards connecting it with the brand. Factory managers when despatching consignments will require to indicate in the advice note the number of sub-marks included in the consignment and the number of boxes bearing each sub-mark. This will enable one box of each mark to be taken as a sample for the grader to examine, and a truer verdict as to the quality of the whole consignment arrived at.

As there are a few who do not yet understand the interpretation of grades as prescribed in the regulations, it will be well to mention that "First class superfine" is a butter that no one can find fault with. It may be perhaps to some extent deficient in fine characteristics such as a full, nutty flavour, and aroma that go to make up a perfect butter, but if the butter has no apparent defect it comes into the "First class superfine" grade. Highest scoring butters receive 98 points; 99 and 100 being reserved for those but rarely encountered. Ninety-eight shillings per cwt. is practically 10½d. per lb., 94s. per cwt. a full 10d. per lb.; the minimum for this grade is 94 points so that "First class superfine" is covered by a range in value of ½d. "First class" embraces that which is fit for any good table and which although marred by any one or more of the defects usually found in butter such as "Slightly cloudy moisture," "Slightly mottled," "Slightly stale in flavour" &c. is—taken on the whole—a good sound butter. As already stated it is such as the better class consumer would tolerate on his table at a price below the top; 86 points, the minimum awarded to this class, if put in shillings, means 9.2d. per lb. and 93s. 4d. per cwt. (93 points is the maximum) equals 10d. per lb. so that the first class butter is covered by a range in value of ¾d. per lb. "Second class" includes that fit for table use by those who are not very particular in this respect. On the one hand consumers with decent palates would not care to have it on their table, and yet a verdict that it was a "Pastry" butter and consequently unfit for table use could not be justified. The minimum points are 75 and as 75s. equals 8d. per lb. this class of butter is covered by a range in value of nearly 1½d.

Fortunately these interpretations agree with the actual difference in value on the local market when it is in a healthy condition, that is to

say pastry butter usually sells at 2½d. below top prices for choicest. In a recent controversy some of the critics implied that the line between pastry and that fit for table use should be drawn at 90 points, but I pointed out that it was immaterial whether the line was drawn at 75 points as provided in the Commerce Regulations, 90 as suggested by some, or at the unit, one point. In the last-mentioned proposal "Second class" butter would be covered by a range from 1 to 50, "First class" from 51 to 80, and the "First class superfine" from 81 to 100. Again, on the other hand if 90 points were the minimum then 90 to 94 would cover the "Second class," 95 to 98 the "First," and 99 to 100 "First class superfine"; but graders would in that event be obliged to use decimal points. The recent conference of dairy experts recommended that the first class minimum should be 88 instead of 86 points from the 1st July next. It is intended to further raise it to 90 points at the earliest opportunity. I have no hesitation in attributing the substantial improvement in quality to grading. Grading is carried out by the Government chiefly, indeed almost wholly, for educational purposes. It is recognised that if the quality be improved higher prices will be commanded. It is estimated that nearly £500,000 worth of business was done on the basis of grade certificates. As the Department has done nothing to encourage the use of certificates for buying or selling purposes, that it has been voluntarily availed of to such an extent is evidence of its value, even in the trading or subsidiary aspect.

COMPOSITION OF BUTTER.

The average percentage of moisture of all the samples analyzed during the season was 13.925 per cent., an increase over last year's which was 13.725. The districts compare as follows:—North and North-Eastern 14.122; Gippsland, 13.955; Western 13.818; and City 13.885. The quantity intercepted from shipment on account of containing more than 16 per cent. moisture amounted to 12 tons as compared with 5 tons for the season 1905-6. In connexion with this question I may quote the following extract from *The Illustrated Western Weekly News* of England, dated 23rd March 1907:—

"BUTTER ADULTERATION. TAUNTON FIRM HEAVILY FINED.

At Bath, on Wednesday, I. J. Wright and Co. Butter Factors, Taunton, were summoned for having sold, to the prejudice of the purchaser butter which contained 16.4 per cent. of water, and which was in course of delivery to the Bath Co-operative Society. The proceedings were instituted by the Sanitary Committee, for whom the town clerk appeared. Mr. C. P. Clarke, of Taunton, was the defending solicitor. The case had been adjourned on several occasions and a fortnight ago the adjournment was granted in order that an official from Somerset House could attend to support the Government analysis. A sample of butter having been submitted the analyst of the Government authorities and their certificate put the water at 15.82. Mr. Gatehouse, Bath city analyst, said the variation between 16.4 which he certified and 15.82 was due to the natural evaporation of the water between the time of his analysis and the further analysis. His evidence was borne out by Mr. G. Stubbs of the Government Laboratory, London. The magistrate imposed a fine of £50 and costs amounting to £8 6s."

The average boric acid contents were .252 per cent. North-East butters show an average of .245, Gippsland .190, Western .32, and City .253. Ten tons were stopped for containing more than .5 per cent. boric acid as compared with 28 tons for the season 1905-6. One hundred and eighty-five tons were stopped on account of short weight as against

133 tons last season. The shippers in most instances unboxed the butter, and spread another half-pound or one pound as required on the bottom of the lump. Although the mere fact of this being insisted upon is tending to minimize the prevalence of this practice, sooner or later, probably very soon, action will be taken to effectually preclude the use of a false trade description.

The latest report at my command showing the composition of New Zealand butter for 1903, gives the average moisture contents at 10.33 per cent., or 3½ per cent. less than for Victorian export butter. I am informed New Zealand's percentage is now up to 11½ per cent., or nearly 2½ per cent. less. This would account for almost the whole of the disparity in prices.

COMPOSITION OF EXHIBITION BUTTER.

The average composition of 139 samples of butter exhibited at the recent A.N.A. Exhibition was as follows:—

Fat	84.286 per cent.	Highest per cent. fat in any one sample...	90.42
Moisture ...	12.791 per cent.	Lowest " " " " "	81.15
Curd ...	.742 per cent.	Highest " " moisture " "	16.0
Salt	1.378 per cent.	Lowest " " " " "	8.0
Boric acid ...	.188 per cent.	Highest " " curd " "	1.15
		Lowest " " " " "	0.30
Total ...	99.685 per cent.	Highest " " salt " "	3.15
		Lowest " " " " "	0.22
		Highest " " boric acid " "	0.39
		Lowest " " " " "	nil

BRAND MUTILATION.

Although in framing the Commerce Regulations it was sought to cover all undesirable practices, and have the trade properly and honorably conducted there is still one thing that does not meet with my support and that is the removal and substitution of other brands, a practice not uncommon. A factory forwards some butter for sale on the local market bearing the same brands as for export. Some of it is bought by exporters, the original brands scraped off, and their own brand put on the package. All that the regulations stipulate is that the words "Pure Creamery butter" or other description should be indelibly impressed on the box together with the name of the exporter or his registered trade mark, so no exception can be taken in the meantime. No matter how well the planing is done, the boxes bear a mutilated appearance and the subsequent branding cannot be as well done as in a press. Even though in most cases the alteration is made from good motives, it is possible by this means to build up a reputation for a brand that may be afterwards utilized for exploiting purposes. Another undesirable feature is that there is no connexion between the manufacturer and the product to its ultimate destination, so that he is denied the credit due to him if it is of superior quality and shirks the odium attaching to that of a low standard. The best way out of the difficulty is for separate brands to be used on butter marketed locally from that exported; then, when an exporter purchases on the local market he can ship it abroad without bringing it into competition with that from the same factory forwarded direct for export. I recognise that many factories have by this time a good-will and it may mean a temporary loss for them to change their local brands, but if the quality is all right no loss whatever may be encountered.

Butter Faking.

A Bill regulating the sale of butter in the United Kingdom has passed its second reading and gone into Committee in the House of Commons. Although good and calculated to regulate the trade it contains a most objectionable and dangerous clause. It provides that the water percentage in margarine and butter is not to exceed 16 per cent. of moisture but butter imitations may have as much as 24 per cent. The adoption of the latter provision will practically mean the legalization of milk-blended butter and other like products. The Minister for Agriculture (Hon. Geo. Swinburne, M.L.A.) has taken a deep and active interest in this subject and has secured the co-operation of all the States in the Commonwealth and New Zealand with the view of having the objectionable clause eliminated.

Pure Foods Act.

The *Pure Foods Act* came into operation on 1st day of this year and provides for a lower moisture content and smaller percentage of boric acid than is employed for export. It must be conceded that this is a step in the right direction; although I do not consider myself competent to express an opinion as to the effect of boric acid on the human system I am quite content to accept the assurance of Dr. Norris, Chairman of the Board of Health, that the less used the better. It is employed to prevent decomposition; digestion is a form of decomposition so if boric acid prevents the one it must impair the other.

I am well aware that butter containing up to .5 per cent. will keep better than that which does not contain any or a fractional part of .5 per cent, but a remedy lies in the adoption of a higher standard of cleanliness right through at every stage during production and manufacture and lower temperatures during transit of the produce to the consumer. Factory managers would do well to aim in this direction in order to meet the requirements of the period.

The more frequent collection of cream is a matter which should have the closest attention. Only yesterday I was informed that a certain factory was sending out collectors with testers, scales, and money to buy the cream, test it in quantities, large or small, at the farmers' doors and pay them cash on the spot. The frequent collection of cream is a matter of vital importance. In a climate such as ours it should be placed in the hands of specialists such as factory managers who are provided with refrigerating appliances to control the temperature and direct the subsequent fermentation so as to make the very most of it from a quality point of view. Wherever a comprehensive scheme of cream collection has been put into operation, the improvement of quality has been marked.

Essential Economies.

In some parts of Victoria it is not uncommon to find cream-collecting waggons employed by different companies travelling along the same route. It is the producer who has to pay for this duplication of service, and co-operative companies are almost as great sinners in this respect as private and proprietary firms. Surely a plan can be formulated whereby purchasers of cream may agree not to overlap each other's territory.

Dairy Inspection and Experiments.

Unfortunately little personal instruction in dairying could be provided during the height of the season, but as soon as the rush was over graders

undertook instructional work among the factories, and, in addition, a large correspondence involving nearly 20,000 communications was despatched during the year. In each case the instructors reported an improvement in quality before they left the factories; if their recommendations are followed this will be maintained. It goes without saying that with six months' experience in grading, officers are better qualified to act as instructors on the one hand, and with six months' experience as instructors they are still better fitted to again carry on the duties of graders on the other.

Certain experimental work has also been carried out, particularly in the pasteurization of home-separator cream and the use of pure cultures during the season, with, in most instances satisfactory results. These were provided, through the Government Cool Stores, by the University and an extension of the system of pasteurization and the use of cultures is certain. As various officers of the Department will be giving papers on the above and other subjects during the Conference, the subject need not be now enlarged upon.

OVERRUN IN BUTTER FACTORIES.*

R. T. Archer, Dairy Expert.

This is a question exercising the minds of those connected with the dairying industry at the present time, and when not properly understood is liable to cause considerable misunderstanding and friction among factory authorities, as it is upon the percentage of overrun that the comparative value of commercial butter and butter fat is based. Take 100 lbs. of butter; on analysis we find it is composed of 83.3 per cent. fat and 16.7 per cent. contents other than fat, which is called the overrun. Then if 83.3 lbs. of fat give 100 lbs. of commercial butter, how much commercial butter would 100 lbs. of fat give?

$$83.3 : 100 :: 100 = 120.$$

This gives 20 lbs. of overrun for every 100 lbs. of fat or 20 per cent. overrun. The amount of butter fat is correctly given by the Babcock tester as 100 *lbs.*; then, if we can save all the fat, convert it into commercial butter and sell it, we should get returns for 120 lbs. commercial butter. This is the theoretical aspect of the case. Now for the practical, which is not so simple.

The overrun is made up of, say, water, 13.7 parts; salt, 2 parts; preservative, .25 part; curd, etc., .75 part; = 16.7. The overrun is a very variable quantity, and is beyond the control of the most skilful manager working under the best possible conditions. This is chiefly due to the variation in the amount of water incorporated in the butter, which is purely mechanical, and exists to the extent of two or three per cent. or more. Taking the analysis of butter exported through the Government Cool Stores for season 1905-6, we find the maximum water contents 16.87 and minimum 10.33, average 13.66. For season 1904-5, maximum 16.07, minimum 8.77. In well managed factories we do not find these extremes, but there may, at any time, be a variation of two or three per cent. of water in the butter.

*Paper read at the Fourteenth Annual Conference of the Australasian Butter Factories Managers' Association, held May, 1907, at Melbourne.

In addition to the variation in the chemical composition of the butter, there are other factors which influence the overrun, and consequently the amount of money available for distribution. It is not alone the amount of butter that is made, but that for which payment is received that controls the sum at the disposal of the Directors. Take a factory receiving milk :—10,000 lbs. milk testing 4 per cent., contains 400 lbs. fat. The separator will take from that, say 1,000 lbs. of cream, or 10 per cent., leaving 9,000 lbs. skim milk which contains, say .1 per cent. fat, equal to 9 lbs. fat lost, leaving 391 lbs. fat in the cream, in which when churned about 15 per cent. water, curd, etc., would be incorporated, making 450 lbs. butter, leaving 550 lbs. of buttermilk. This will contain, on an average, .2 per cent. fat, or an additional loss of 1.1 lb. fat.

Other unavoidable losses are due to milk being left in cans, etc., cream and butter sticking about cans, churns, and other utensils. Experiments have proved that losses from these sources amount to about 3 per cent. of the total fat available, thus reducing the available fat by another 12 lbs. that is :—

Loss of fat in skim milk	9.0 lbs.
Loss of fat in buttermilk	1.1
Loss of fat sticking to utensils, &c. ...	12.0
	22.1 lbs.

This leaves 377.9 lbs. out of the original 400 lbs. of fat to make into butter, which, with the addition of 20 per cent. overrun equals 377.9 x 1.20 = 453.48 lbs. commercial butter, instead of 400 x 1.20 = 480.0 lbs. commercial butter if no fat were lost. That is equal to a loss of 5.52 per cent. loss on the butter produced.

If all the butter is packed in export boxes, 56½ to 56¾ lbs. are put in each box and sold for 56 lbs., practically a loss of one per cent. If a large amount is printed, which is the case in many factories, there is generally a loss of 3 to 5 per cent. according to the method adopted. It will average 3 per cent. although sometimes 56 lbs. can be got out of a 56½ lb. box. If a factory prints 25 per cent. of its output, there is 3 per cent. loss on that which is equal to .75 per cent. on the whole output, equal to 3.4011 lbs. and 1 per cent. on the remaining 75 per cent. or .75 per cent. on the whole output equals 3.4011 lbs. To state this clearly we take 453.48 lbs. commercial butter :—

Loss ½ to ¾ lb. overweight per 56 lbs. box — 1 per cent. on ¾ output	3.4011 lbs.
Loss on print butter, 3 per cent. on ¼ of output	3.4011
	6.8022 lbs.

This leaves 446.68 lbs. butter to receive payment for, or a loss of 1.58 per cent. That with the 5.52 per cent. lost above makes a total loss of 7.1 per cent., leaving an overrun of 12.9, practically 13 per cent. for distribution out of the original, or theoretical 20 per cent.

The only difference between a factory receiving milk and one receiving cream is that the former has a loss of 9 lbs. of fat in the skim milk which would increase the overrun of the cream supply factory by 1.1 per cent.

There would also be rather less loss in handling the raw material as the milk would not be handled at all, making an additional difference perhaps of 1 per cent., or about 2 per cent. in all. Other features may make a variation, for instance, the percentage of salt added—whether a large proportion of fresh or unsalted butter is made. The difference between salt and fresh butter is from 2 to 3 per cent. in favor of the former; then if half the output be fresh, there would be a reduction on that account of, say 1½ per cent. on the whole output.

Now we come to the starting point again, that is the amount of money available for distribution and how to apportion it. As butter fat, instead of commercial butter, is now the basis of payment, and taking the 20 per cent. overrun for simplicity as an example, if we could pay 10d. for commercial butter, we could pay 10d. x 1.20 = 1s. for butter fat. If we had a 16 per cent. overrun, we could pay 10d. x 1.16 = 11.6d. or a fraction over 11½d. With a 13 per cent. overrun it would be 10d. x 1.13 = 11.3 or a fraction over 11¼d.

The foregoing is the outcome of recent investigations to ascertain the actual overrun in Victorian factories treating both milk and cream. It is also confirmed by experiments in other countries, as may be seen by reference to Farringdon and Woll's "Testing Milk and its Products," pages 177 and 185.

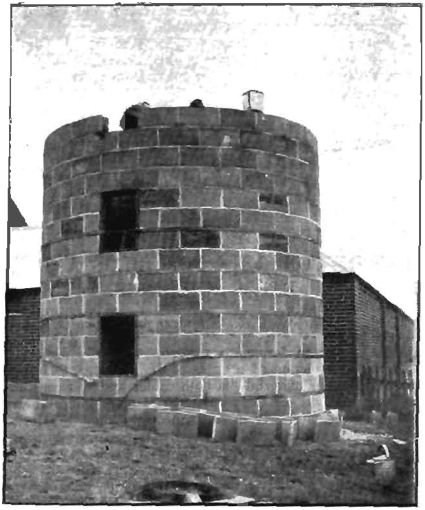
THE USE OF CONCRETE FOR SILOS AND OTHER FARM BUILDINGS.

A. S. Kenyon, C.E., Engineer for Agriculture.

Of late the American farmer has gone in largely for concrete as a material for the construction of all classes of buildings. It is of greater strength than any other material; is both cooler and warmer than brick or timber; is free from risk of fire; but what is more important, is cheaper than the former and little, if any, more costly than the latter in cases where the necessary raw material is easily obtainable. Timber is becoming scarcer and dearer every year and in the sawn form has only a moderate life, while round timber, except, perhaps, for uprights, is not economical. Bricks get hotter than concrete and take longer to cool down. In short, concrete is an ideal building material provided it can be readily and economically manufactured. Now there is really very little difficulty in making good concrete if some care be taken in following the advice here given.

Concrete is composed of metal (broken stone) or gravel mixed with sand and Portland cement in certain proportions and wetted. In "fine" concrete no metal is used, small gravel taking its place. Cement and sand alone form a mortar or "compo." The proportions of the various materials depend upon the air voids or spaces in the metal or gravel and upon the strength of concrete required, varying with the uses to which it is to be put, engine foundations and hollow blocks representing the strong side, and building foundations and solid walls the weaker class. The mortar or "compo" of sand and cement should be sufficient in bulk to fill all the voids in the metal, preferably somewhat in excess, say about 10 per cent.

In all ordinary cases, the strength of the concrete is that of the cement mortar or "compo," so that it is best to have the metal with as few voids as possible, the metal being cheaper than the "compo." This end is achieved by using gravel or metal screenings with the metal, thus to a large extent reducing voids. Briefly, the office of the metal and gravel is to enable a comparatively small amount of cement mortar to occupy a large volume without any serious diminution of its strength. The process is carried so far as to permit the use of large boulders weighing several hundredweights each, imbedded in the mass of the concrete. The voids can be found by filling a kerosene tin with the metal or gravel, making a



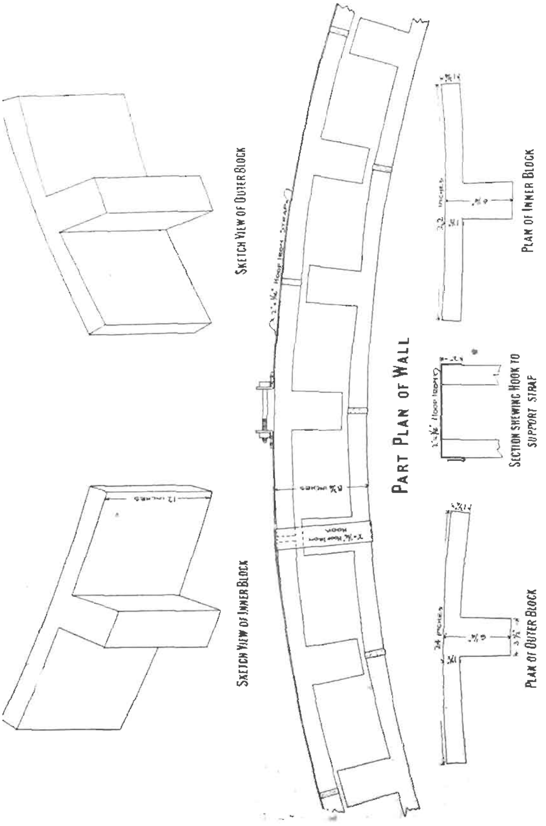
THE CONCRETE SILO, BALLARAT ORPHAN ASYLUM.

bulk of 4 gallons; the whole is then weighed, allowance being made for weight of the tin. Water is poured in until flush with the surface and the tin with its contents is again weighed. As water weighs 10 pounds to the gallon, the difference in the two weights will give the void space in gallons and thus the percentage is arrived at. For instance, a kerosene tin full of metal weighed 60 pounds deducting the weight of the tin. When filled with water, it weighed 78 pounds. Consequently the void space was represented by 18 pounds of water while the whole volume, 4 gallons, weighed 40 pounds. Thus the percentage of void was found to be 45. A good mixture in this instance would be 6 parts of metal, 2 parts of sand, and 1 part of cement.

In the example given, the metal was fairly large, about 2½ inches. The percentage of void space increases as the size of metal or gravel diminishes, running from 35 to 45 in ordinary cases. For fine work, such as hollow blocks, fine gravel of not greater than one-half inch diameter is used. If it is mixed with sand, so much the better. In such a case, cement should be added in a proportion ascertained in a similar way to that already described, and should be not less than one-sixth of the bulk, and about one-half of the sand contents. Before, however, working out the proportions, the material should be selected, care being taken that the metal or gravel is of fairly strong and clean stone; soft sandstones or limestones are to be avoided. The sand, in particular, should be sharp and clean; it should lose but little in bulk by being washed. Both clay and loam are drawbacks, particularly the former. Attention should next be paid to the cement. Tests of the cement are rather too delicate and complicated for the ordinary man, so that reliance must be placed on the brand. On the whole, the locally made cements are to be preferred to the imported makes, as they are all reliable and are slow setting, a desirable feature for the amateur in concrete, while the imported brands, though very good in some cases, are not so in all. A cask or barrel of cement weighs about 375 lbs.; a cubic foot packed weighs about 120 lbs. In colonial makes, it is generally supplied in bags, two of which go to the cask. As a rough and ready rule, one barrel of cement goes to the cubic yard of concrete. It must be borne in mind that one cubic yard of gravel or metal is required for one cubic yard of concrete, the cement and sand serving only to fill up the voids.

For mixing, a platform or smooth space is required. A mixing board can readily be knocked up out of ordinary boards. Frames also are made out of boards to hold, say one-half a cubic yard of metal, one-sixth of a cubic yard of sand, and one-twelfth of a cubic yard of cement, or in any desired proportions. The sand *which should be dry* is first put in its frame on the mixing board and then the cement is added. The two are thoroughly mixed by being turned over with shovels, and the mixture is spread as thinly as possible in one layer over the board. The metal gravel or screenings is then measured, and spread on top of the cement and sand. Mixing by shovelling is thoroughly done, after which water is added; a watering-can with a rose is best for the latter purpose. Shovelling is continued until the whole mass is sufficiently wetted, that is, when in a pasty condition, but not enough so as to run or be sloppy.

A batch may be, as mentioned, above one-half a cubic yard, or for bigger work, one cubic yard. Shelter from the wind is advisable, otherwise there will be a loss of cement. The concrete should be mixed as near its final position as possible; it must be used at once and not allowed to stand over the dinner hour—under no circumstances until the next day. If it is used in bulk, it may be lightly rammed in position with a small headed rammer. Care should be taken in ramming not to keep it up longer than the commencement of setting, a matter of a few minutes only; nor should ramming be continued after the "compo" has been worked to the surface and free moisture is showing on the top. Any old work, including that finished off the previous day, should be well wetted and picked over to form a bond. In dry weather or at any time except in moist weather the concrete, whether in bulk or in blocks, should be kept damp by wetted bags or other means for a few days to allow the setting action to proceed properly.


Sketch View of Outer Block
Sketch View of Inner Block
Part Plan of Wall
Section shewing Hook to support Strap
Plan of Inner Block
Plan of Outer Block

With local brands of cement, "air-slacking" is of great importance. If at all possible, the cement should be emptied out on the floor of some building, sound enough to protect it from the wind and weather. It should so remain about three weeks and should be turned over twice in that time. With the imported brands, sufficient time to insure effective "air-slacking" has elapsed since their manufacture.

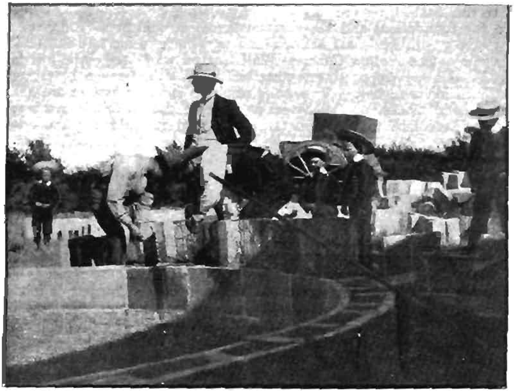
"Rendering," by plastering the rough outside surfaces of the concrete with cement and sand, is not to be recommended. It is difficult under the best of circumstances to make a good job of it, and unless well done it is better left alone. If a specially smooth surface be desired, it can readily be attained by making a facing of cement mortar put into position as the filling with the ordinary concrete progresses. Special moulds, to be drawn out as the filling progresses, may be employed; but the shovel is sufficient for all practical purposes.

In this State little use has as yet been made of concrete for buildings save for foundations and for some instances of reinforced concrete, that is, concrete with steel bars or rods built in with it to increase its tensional strength. The Hollow Concrete Wall Company of Melbourne has lately introduced a method of constructing buildings with concrete blocks which has much in its favour. The walls resulting from its system are hollow, though solid blocks, not hollow as in some of the American systems, are used. Reference to the illustrations will aid in following the ensuing descriptions.

By means of a moulding machine, the patent rights of which are held by the company and which can be obtained on hire at reasonable rates, blocks of 24 inches in length and 12 inches in breadth are made, the thickness being under the control of the operator. Running across the width of the block and in a central position is a projection called a "root," which is from 3 to 4 inches wide and of a depth depending upon the thickness of the wall to be constructed. The block is T shaped in section. For ordinary 9-inch walls, the thickness of the block is about 1½ inches and the "root" projects about 5 inches. Concrete is mixed as described above, a sufficient quantity put into the machine and the block moulded. It is then lifted out on a "bearing off" board and put aside until set sufficiently to handle in building. This takes a few days, depending upon the weather and the brand of cement used. During this time, the blocks should be kept well damped. One man with the assistance of a lad can make from 100 to 150 blocks in a day, equal in a 9-inch wall to 1,000 to 1,500 ordinary bricks. One cask of cement, and one cubic yard of gravel and sand will make about 80 blocks. A man with the same assistance will, after a little practice, lay 100 blocks per day; that is, a wall 10 feet by 10 feet high. Special blocks may be made for corners, door jambs, &c. The blocks are set in cement mortar of suitable strength in a double row with the "roots" alternately opposite the joints between the ends of the opposite blocks. In the next row or course, the blocks break joint and consequently the "roots" come on top of one another from either side, making the work complete and satisfactory yet allowing the free circulation of air throughout the interior of the wall.

As an experiment to test the cost and the strength of such a method of construction for silos, one was erected at the Ballarat Orphan Asylum. This silo with its novel appearance, added a new interest to a place always attractive by its charming flower beds, its well-kept kitchen garden, its neat, well-drained and cultivated paddocks, and last but not least, well-trained and happy-looking inmates. The silo was erected

by the company for the same price and under similar conditions to the wood and iron silos put up by the Department of Agriculture. The blocks, in order to fit in with the circular plan of the accepted form of silo, had to be somewhat modified in form and special "bearing off" boards were required. The gravel and sand already mixed were obtained locally. Screening was necessary to remove pebbles much over half-an-inch. The blocks were readily made by some of the boys at the Orphanage though their weight, a little over 50 lbs., was rather great for the boys' strength. A ring of cement concrete 12 inches wide and 6 inches bedded upon sand was set down as a foundation for the silo which was 16 feet and 15 feet 6½ inches, outside and inside diameter respectively, and 21 feet in height. Portholes, 3 feet by 2 feet, were put in at every 3 feet of height, making three in all. These were framed in 6 by 1 oregon. Doors were made

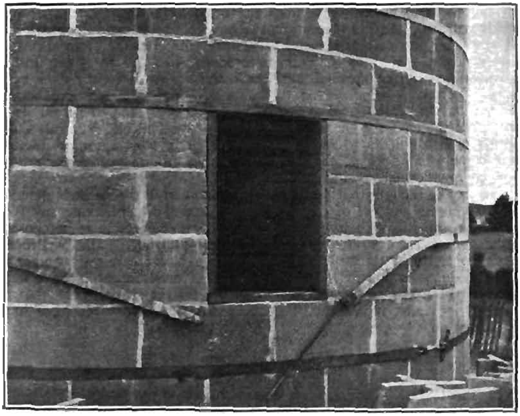


THE CONCRETE SILO. LAYING THE SECOND COURSE.

of No. 24 gauge iron which was lapped over the edges of the portholes and stiffened with three 6 by 1 boards, the latter resting against the frames. In order to strengthen the wall against the outward thrust or pressure of the silage, five bands of 2 inches by one-sixteenth of an inch hoop iron, with lugs bolted on to ends and tightening bolts, were put round the outside of the silo at every second course up to the tenth. Thus for half the height of the silo, every block has some support from the hoop. Above these the pressure is too slight to need much precaution. The hoops are kept in place by bent iron hooks or holdfasts built into the wall as shown in the illustration on page 404. Where the hoops pass in front of the porthole doors, they can be slackened and let down out of the way when the portholes come into use, as the diminution in the contents by that time would have removed any outward pressure. While in course of construction, however, a departure from the hoop-iron reinforcement or

strengthening was made. Two strands of No. 12 gauge hard steel wire were laid on the top of each ring at every course—four wires to each course—and built in with the blocks. This method of reinforcement is preferable as the wires are not subject to contraction and expansion to such an extent as the hoops in their exposed position. Apart from the chance of cracks, neither of these precautions appears necessary, the concrete being strong enough to withstand the pressure of the silage. It is advisable all the same to reinforce the silo as described. Such a course is even more essential in the case of a brick silo.

In the Orphanage silo, about 13 cubic yards of gravel and sand together, 13 barrels of cement, and 250 feet of hoop iron with the necessary lugs and bolts, were used; about 2,000 feet of No. 12 gauge steel wire might be used in preference to the latter. The wire will weigh about



THE CONCRETE SILO SHOWING HOOPS AND PORTHOLE.

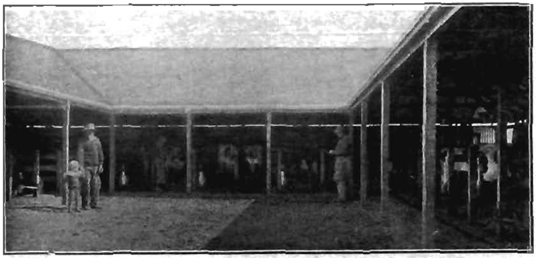
3 cwt. The porthole doors will require two sheets of 6 by 3 iron (No. 24 gauge), and 50 feet of 6 by 1 timber. The roof may be of any suitable design. About the cheapest roof in iron will need 16 sheets of 8-feet galvanized corrugated iron and 100 feet of 4 by 2 timber. Timber for scaffolding, put up inside the silo as work progresses, is necessary, but is available for use elsewhere on completion. With these quantities and the rates of work quoted above, the cost on a farm of a concrete silo may be estimated.

The silo has not yet been filled; the past summer was an unfortunate one for fodder crops and the maize relied upon to fill it turned out badly. It will, however, be easily filled next spring. Lime washing is essential in the concrete as well as in the iron silo.

CONCRETE FLOORS.

For flooring, the thickness of the concrete will vary with the use of the building. Three inches of concrete with half-an-inch of facing or rendering are sufficient for silos, if it be thought necessary to floor them at all, while for separator rooms or cowsheds, 4 to 6 inches with the same thickness of rendering would be required. In the case of separator rooms or similar buildings, the rendering should be strong—about equal proportions of cement and sand—and for specially fine work, a sprinkling of neat cement may be put on the rendering and well trowelled until it becomes hard, smooth, and even glossy. The floor should be formed out in the solid and well rolled; if in fill or on made ground, it should be thoroughly rammed after formation. On this surface should be laid 2 or 3 inches of sand, on which, when well wetted, the concrete is laid. The concrete should be laid in strips or sections from 4 to 6 feet in width and 8 feet in length. The sections should be separated by battens which are afterwards removed, and the spaces grouted in with cement mortar of two parts of sand and one part of cement. This prevents cracking from shrinkage. The concrete should be made in accordance with the foregoing instructions, and should be rammed until the surface is made level by the excess of the "compo" being forced to the top. The facing coat of cement mortar, varying from equal to double proportions of sand to cement, is put on before the concrete has set and is neatly trowelled off. A fall should be given in all floors to facilitate the run off of any water or drainage. Any corners or edges as, for instance, manure gutters or "grips," should be well rounded off.

It may be thought that there is over-elaboration in the methods described for the making and use of concrete; but it is well when making any structure to insure a satisfactory job, and satisfactory concrete is not possible without very careful attention to apparently trivial details. Properly made, it is the finest structural material we have; carelessly and ignorantly made, it is one of the worst. Still I must repeat, good concrete is well within the powers of the ordinary farmer and where the raw material is handy, it is one of the most economical and valuable of building materials.



THE POSSIBILITIES OF CHEESE PRODUCTION IN VICTORIA.*

J. G. McMillan, N.D.D., Cheese Expert.

Many reasons might be put forward why Victoria is not what may be termed, in the true sense of the word, a cheese producing State, though, as Mr. Crowe has pointed out, the production of this article of diet has increased considerably during the past year. Instead, however, of only making about 2,000 tons, five times that amount ought to be produced. There are several important factors conducive to the successful development of the cheese industry and these are: climate, suitability of country, cleanliness, good water, ability of the cheesemaker, suitable plant and buildings, the bringing of the product before the public, and markets for our output.

We often hear the remark that Victoria has too hot a climate for the production of good cheese. This statement has been shown to be utterly fallacious as proved by practical results. Mr. Sawers, the New Zealand expert, who was one of the judges at the Melbourne A.N.A. Exhibition in January last said, when commenting upon the champion exhibit, that it was the kind of cheese New Zealand was aiming to produce. It may be also mentioned that the cheese which obtained the champion prize at the 1905 Royal Agricultural Show was made when the temperature was 110 degrees in the shade, and even then a starter was used. Excessive heat is certainly objectionable, but it does not follow that a high temperature is always so. Humidity is of great concern to the cheesemaker for it has been proved that 80 degrees is often a more trying temperature to contend with than is 100 degrees when at such temperature the air is drier. Any cheesemaker will tell you that a muggy morning is the worst for successful work. That is generally when the makers in Great Britain at certain times of the year have difficulty in making a really good article.

The most suitable soil is a calcareous one, in other words, a soil containing a sufficiency of lime with clean pastures fairly free from rank leguminous plants. Lucerne fed green is very objectionable. The buttermaker knows this as well as the cheesemaker. I have lately experimented with tainted milk by heating to different degrees of temperature. Time will show whether this treatment has been successful. I believe that it has. Even though this experiment turns out satisfactory, it must not make any difference to strict attention being paid to cleanliness from the milking of the cow to the completion of the whole process. Cleanliness, as you all know, is of the utmost importance in dairying, and there is no need for me to dilate as to how it should be carried out.

Probably the most important factor is the ability of the cheesemaker. It has been customary in the past to look upon cheesemaking as merely a matter of adding rennet, applying heat, stirring and keeping time. Never was there a greater mistake. With all due respect to buttermakers the same skill is not required to make butter as for cheesemaking. I have heard of people saying that any person of ordinary intelligence could become a perfect cheesemaker after a fortnight's tuition. No greater fallacy was ever promulgated—a statement with which every one fully conversant with the art of cheesemaking will agree. Cheesemaking is a branch of

*Paper read at the Fourteenth Annual Conference of the Australasian Butter Factories Managers' Association held May 1907, at Melbourne.

agriculture in which there is no royal road to success, but a careful practical training is necessary before the student can be intrusted with the management of a factory. As to how long this should be depends a great deal on the intelligence and diligence of the student and the ability of his teacher. A year at least should be spent with a good maker, and in the opinion of Mr. Sawers two years' apprenticeship should be served before anyone is allowed to take sole control of a cheese dairy. If, however, the shorter period only was spent, instead of entering into the work after a few days' experience, the improvement in our cheese would be very great. As to becoming perfect this has never been nor will there ever be a cheesemaker who will reach this standard. Experience generally teaches one how little he knows and how much there is to learn. Professor Drummond of the Scottish National Dairy School, after 35 years' experience, considers that he knows less than he thought he knew when he first started. This generally applies in all cases and when a person gets to think he knows too much, his case is hopeless. Canada, New Zealand, and Great Britain owe their success as cheese producing countries to their employment of experienced makers.

The question may be asked, How is this to be done? The only way is for good men to be trained by thoroughly practical makers. But besides a close observance of practical instructions, the man who hopes to have a successful career must have a thorough grounding in the elementary sciences. He must have an earnest desire to reach the highest standard of excellence from the inception of his education, without which desire he will never command a foremost place, or be capable of overcoming the difficulties which continually confront him. To achieve this standard of proficiency it is necessary that a Dairy School equipped with all the most modern appliances be established. With the exception of New Zealand, which is contemplating this step, nearly all dairying countries have such sources of instruction. It may be almost termed a calamity that such a magnificent dairying country as Victoria cannot boast a school of this kind. When a young man goes to a dairy school he often has exaggerated ideas of his own abilities, but generally after a few days he finds that his knowledge is very slight indeed.

A visitor to any of the Dairy Institutes in Great Britain, or Denmark will notice that the first thing a student is taught is the danger of uncleanliness, and throughout the course, the evil effects of this initial weakness are brought continually under his notice in the most impressive manner. He is made to realise that without the observance of this essential principle, his future work is doomed to failure. After serving an apprenticeship at such an institution, the young man will be able to make the characteristics of his factory prove of educational value to the milk suppliers. Dairy Institutes are not only suitable for the training of factory managers, but when farmers or their wives, sons and daughters, spend a week or two at such, the matter of cleanliness is so impressed upon them that improvements are made and so relieve the factory manager of much anxiety, and save him from calling attention to dirty milk and cans, which is at all times a very delicate subject and requires a considerable amount of diplomacy on his part. Let him be ever so diplomatic, he is liable to get into hot water when mentioning the subject. Should any of you ever visit Great Britain be sure and have a look at some of the farm dairies in Ayrshire in which county the Scottish Dairy School is situated, and it will be observed that the faithful following of a sound training finds its expression in the spotless appearance of the dairies. Even the

crudest building will show that the foundation of success has been observed. All of you know that on the farmer depends much of the success of a factory; unless cleanliness is strictly observed by him the difficulties of making a first class article are increased, as with impure milk even the efforts of science and skill are of little avail. With the factory manager and the dairyman properly trained and realising the responsibilities that devolve upon each the success of the cheese industry is assured.

Good buildings, not necessarily elaborate, are of course essential. The rooms should have high ceilings and good floors, be well ventilated and lighted, and have walls that will not be too susceptible to changes of temperature. The ripening room is the most important. It should have well insulated walls so that the temperature may be kept as near 55 deg. as possible. To the keeping of cheese in bad curing rooms may be attributed the cause of many spoiled lots. No matter how well the article may have been manufactured, subsequent overheating renders all previous care futile. To the cheesemaker who cannot afford an expensive building, I would commend the use of thatch roofs washed, after being put on, with a solution of lime and salt which renders the thatch less susceptible to fire. In hot weather it would be advisable to send the cheese every week to the Government Cool Stores, where the storage charges are very moderate, and are covered by the saving in weight and quality.

The cheese plant should be of good quality and well arranged so as to avoid all unnecessary labour. No plant is complete without a Mann's Acidometer test, it being of material benefit at the drawing of the whey, salting and pressing; by its use uniformity is obtained, especially when used in conjunction with the rennet and hot iron tests. The object of the cheesemaker should be first to obtain flavour and quality, then quantity. The aim of many cheesemakers has been to obtain a large quantity of curd by the retention of an excess of moisture at the expense of quality. At the A.N.A Exhibition, the evil effect of this practice was very noticeable in the weakness of body, and also the tendency to over acidity. With a soft curd there is always a danger to over acidity in the ripened cheese. Cheese made from soft curd will also lose more fat in the press and more weight in the curing room, not to speak of flavour, than that made from a curd of proper consistency. The more moisture retained in the cheese the greater is the liability for it to go wrong.

Ever since I started giving instruction in Victoria I have recommended the smaller cutting of the curd. By doing this it is easier to expel the moisture, and the maker has more control over the cooking process. It is also not necessary to scald to such high temperatures. If carefully manipulated, the loss of fat will be very little more than if the curd is cut into large cubes. I could mention several leading makers who have adopted this plan with great success. I noticed when in Great Britain last year that in most dairies the curd was cut almost as fine as wheat grains, yet a more velvety bodied cheese was obtained than would be found generally in Victoria. The whole secret lies in controlling the acidity. When allowed to go too far in a soft curd an acid cheese is the result, but in a firm curd probably 25 per cent. more acid may be developed, giving a velvety bodied cheese. The length of threads in the hot iron at salting is no criterion to go by, unless the consistency of the curd as regards retained moisture is taken into consideration.

The Department of Agriculture has endeavoured to bring the quality of our best Victorian cheese before the public at recent Royal Shows, and also through the A.N.A. at the late Exhibition. The public generally

expressed surprise to know that we produced cheese of such quality and that it was as good as New Zealand. Little do the housewives know that when they are purchasing a piece of cheese with a card bearing the words "New Zealand Cheese" that the article was really made in Victoria. One has only to look at the windows of certain of our shops and see cards marked "New Zealand Cheese and others" the others and New Zealand being mostly of the same make. The duty on New Zealand cheese is 3d. per lb., the shop-keeper obtaining this extra price by fraudulent description. Some time ago I was informed by the Secretary of one of our cheese factories, that one large shop has two counters, one for New Zealand cheese and the other for Victorian, the cheese on both counters coming from the factory referred to. By putting on the word "New Zealand" the retailer commands probably 3d. per lb. more, yet I think this is too high a price to pay for the compliment of having Victorian cheese sold as New Zealand, and it is high time this public imposition should be checked. To the uninitiated, I may say that there are no loaf cheeses imported from New Zealand, in fact, hardly anything under 60 lbs. in weight, so that if your grocer offers you a cut from a loaf cheese as New Zealand you will know that you are being imposed upon. I would advise cheesemakers to brand each cheese conspicuously, in this way advertising their factories and bringing Victorian products before the public generally.

Shows, in a sense, bring cheese under public notice, but many defeat the object they have in view. In many cases the exhibits are few in number, and the awarding of prizes in such instances is not justified unless the cheeses are really of a high class standard. In judging at shows, I would recommend that the judges do not see the exhibits until after the awards have been made for flavour, texture and color. Samples on triers, together with a piece cut out of one cheese in each exhibit should be brought to them into a well lighted room. The points for flavour, texture and color should be recorded, and then the cheese examined for finish, the whole being superintended by two stewards. By this means, judges would be freed from any accusations of partisanship.

If we want to develop our cheese industry we must establish an export trade. Such a trade has been important to the butter industry, and it is just as necessary for the allied branch. We have sent some to London this year, but owing to difficulties arising with the shipping companies, I am afraid the result will be disappointing for various reasons. The cheese will land in London when the market for foreign produce is at the lowest, and it will also be too old. Next season we must take time by the forelock and send a shipment about the middle of October so as to arrive in time for the Christmas Market. It is to be hoped also that the Butter Committee will see to conditions being inserted in the carrying contract, so that cheese will be carried whenever desired, and not, as at present, at the pleasure of any ship that may have room. It is hardly necessary to mention that the consumption of cheese in Great Britain is very great, in fact, almost incredible, amounting to over 200,000 tons per annum. Of this, Canada sends about 100,000 tons, New Zealand 8,000 tons, the remainder coming from the United States. Holland, Germany and France, and that manufactured in Great Britain itself. We have the advantage of being able to place our cheese on the home market when there is very little competition from other sources, as Canada at the time we are sending is in the depths of winter. The principal variety imported into Great Britain is made on the Cheddar principle. It is

therefore evident that we will have no difficulty in placing our surplus product. We must, however, send the best quality, and as the London merchant is amenable to reason, and in a sense has a brotherly feeling towards the Colonies, he will purchase colonial products in preference to foreign, provided the price is right and quality good.

That cheesemaking is profitable is evident from the fact of Canada and New Zealand going in so largely for its manufacture. New Zealand's output in 1905 was 82,421 cwts.; 1906, 107,825 cwts.; 1907, 162,913 cwts., *or 100 per cent. more than in 1905.* Mr. Sayers was rather astonished that we did not turn out more cheese considering the extra profit. He pointed out places where, if in his country, he would make cheese instead of separating. From him also I learnt that many creameries in New Zealand are being converted into cheese factories. We need not hope to produce the same amount as Canada, but I think there should be no difficulty in imitating our nearest sister Colony. I do not say turn our butter factories into cheese factories, but I do say that every milk receiving factory in the State should have a cheese plant. In the spring months, October, November and December, part of the supply should be made into cheese, and it will be found more profitable. As an example let us take milk containing 3.8 per cent. fat. It is calculated that 5,360 gallons of milk of this quality will produce one ton of butter. The manufacturing and marketing of this quantity in London, costs, according to the balance sheet of the Colac Dairying Company, 1.98d. per lb., or a total of £18 9s. 7d. on the consignment. The average price for the best butter in London during the past season was 104s. 9d. per cwt. = £104 15s. per ton. Deducting the £18 9s. 7d. a balance of £86 5s. 5d. remains, allowing 3.86d. per gallon, 9.24d. per lb. butter, and 10.26d. per lb. fat to be paid suppliers. This is paying everything to the dairyman and not allowing anything for dividend or depreciation. Five thousand three hundred and sixty gallons of milk of same quality made into cheese would produce about 5,300 lbs. of cheese, which at 56s. per cwt. would realise a total of £132 10s. The number of 70 lb. cheeses would be approximately 76, requiring 38 cases at 1s. 8d. each

	£	s.	d.
38 cases at 1s. 8d. each	£3	3	4
Labor, Manager 10s. per day, 3 assistants at 6s. treating 1,700 gallons daily (3 days) ...	4	4	0
Firewood	0	6	0
Rennet	0	11	0
Color	0	5	0
Cloth	0	9	0
Salt	0	6	0
Carriage and cartage to Melbourne at 30s. per ton	3	15	0
Carriage to London at ½d. per lb.	11	0	10
Commission, Bills of Lading, etc.	4	10	0
	£28	10	2

Deduct these expenses and allow £104 to divide amongst suppliers, not providing for dividend etc.; this equals 4.65d. per gallon, 11.14d. per lb. butter, 12.37d. per lb. fat. In favor of cheese .79d. per gallon, *1.90d. for butter, and 2.11d. for butter fat.*

The cost of producing and marketing cheese in London is approximately 1.3d. per lb., the amount being reduced or increased according to quantity of milk dealt with. The average price for New Zealand for season ending 31st March last was 55s. 3d. per cwt., and 162,913

cwts. were exported. For the past seven seasons, the amount of cheese exported from New Zealand was 709,933 cwts., the money value being £1,722,983, or an average of 48s. 6d. per cwt. Taking the same amount of cheese, viz., 5,300 lbs. at 48s. 6d. per cwt. = £114 15s. 8d., less £28 10s. which gives a balance of £85 5s. 6d. leaving almost exactly the same to be given suppliers as for butter. The prices for butter, however, have been considerably over ordinary rates. Taking the average price of export butter at 100s. (£100 per ton), the same expenses would leave a balance of £81 10s. = 3.64d. per gallon, 8.73d. per lb. butter, and 9.70d. per lb. butter fat. Taking this year's "over average" price for Victorian butter and cheese bringing same average price as New Zealand, the difference is 1.01d. per gallon, 2.41d. per lb. butter, and 2.67d. per lb. fat in favor of cheese. For the local market, it costs the Colac Company to manufacture and market 1d. per lb. allowing the butter to bring 11d., 102s. 8d. per cwt. The amount available to suppliers for a ton of butter would be, after paying expenses without allowing for dividends etc., £88 13s. 4d. = 3.97d. per gallon milk, 9.50d. per lb. butter, and 10.05d. per lb. butter fat. The cost of manufacturing and selling cheese on the local market would be about .7d. per lb. a total amount on 5,300 lbs. cheese of £15 9s. 2d. The cheese realises 5d. per lb. = £110 8s. 4d. leaving £94 18s. 2d. for distribution amongst suppliers; without other deductions = 4.25d. per gallon, 10.17d. per lb. butter, 11.29d. per lb. fat *i.e.* .22d. per gallon, .67d. per lb. butter and 1.24d. per lb. fat, in favour of cheese. In this calculation the best ruling prices for butter and a medium average for cheese are taken.

Lately I visited a factory where part cheese had been made during the half year ending 31st December, and it was estimated that if all the milk had been converted into cheese almost 1¾d. more per lb. fat in the milk would have been paid. I could give instances of farmers who make cheese averaging 30s. to 50s. per cow over the neighbour who separates. One farmer in the Western District thought he would give up cheese-making. He had about fifteen more cows than his brother on the same sort of land. His cheques were so much below his brother's that he calculated he had incurred a loss of over £200. He has re-started cheese-making. I do not say give up buttermaking, but I do contend that every milk receiving factory should have a cheese plant, and manufacture a few tons at certain times of the year. We have Queensland and New South Wales becoming keen competitors on our own markets. They might be able to produce as good butter, but it is questionable whether they will ever attain to a great position with cheese. It would also be beneficial for settlers in the back blocks, where it is difficult to get produce away, at least when they can cart milk, to manufacture cheese in place of the more concentrated article. The plant also costs about one-fifth that of butter making so that there would be a much smaller outlay at the beginning.

LAMENESS IN HORSES.

(Continued from page 380.)

S. S. Cameron, M.R.C.V.S., Chief Veterinary Officer.

Corns.

Bruises of the sensitive structures underlying the sole in the angle formed by the bar and wall of the hoof at the heel, are termed corns (see *Fig.* 54. seat of corns). The sole corn is very thin at this part, and is therefore less able to protect the sensitive structures underneath against injury from pressure of the shoe or other violence. The bruise is evidenced by the blood-staining, softness and sponginess of the horn of the part, which will be moist or may even discharge matter if the bruise has been a severe one.

It is only in rare instances that corns are found on the hind feet, which have seldom the flat conformation of the fore feet. The heels are stronger, the soles more arched and the wall is therefore better able to support the shoe without the necessity of allowing it to rest partly on the bars. The inner heels of the fore feet are the most frequent seat of corns on account

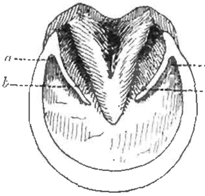


Fig. 54.—Ground surface of hoof. *a*. Seat of "Corns." *b*. Horny bar.

Fig. 55.—Hoof shod for corns with three-quarter shoe.

mainly of the horn on the inner heel being weaker than that of the outer. The practice of fitting the inner web of the shoe to the wall whereby part of its bearing is on the seat of corns is also responsible in some degree. This practice is adopted presumably to prevent brushing, but it is unnecessary, as in brushing a horse does not touch with the heel but with the quarter or toe.

Causes.—Corns are seldom seen in bush horses in Australia, and as the majority of horses in the country are never shod it is not unreasonable to conclude that the disease is associated with the practice of shoeing. It may be not altogether the fault of the shoeing-smith either, for the owner, by neglect to have the shoeing attended to at reasonably frequent intervals, often contributes in large measure to the causation of corns. On this subject the remarks of the late Captain M. H. Hayes, F.R.C.V.S., who is widely experienced in regard to it, are so apposite and informative that the liberty is taken of quoting him at length. He says: "The

common and pernicious practice of cutting away the bars, undoubtedly, disposes the foot to contract this ailment; for the wall at the heels, when it loses the support afforded by the bars, is apt to bend inwards and to press on the seat of corn. It sometimes happens that, when "preparing" the foot, the smith rasps down the wall at the heels without also reducing the horn over the seat of corn, which then bears the greater part of the pressure, with the natural result of this injury. Again, when the heels of the shoe are "sprung"—that is, when a space is left between them and the horny heels—grit and particles of stone are apt to work in between the web of the shoe and the "seat of corn," and, consequently, to hurt the latter on account of its being constantly hammered upon by the former, whenever the animal moves.

Fig. 50.—Slipper and bar shoe combined for corns on both sides. (After Hayes.)

"The principal manner, however, in which horses get corns from shoeing, is undoubtedly the practice adopted with hunters and other saddle-horses, of having the shoes on the fore feet short at the heels, and of making the outward edge of the inner heel of the shoe to coincide with the outward edge of the wall of the hoof at that part, or even 'set' slightly inside it. Here, although the position of the shoe is perfect for the time being, it does not allow for the continued opening out and lengthening which the heels undergo during the downward growth of the hoof. Consequently when a shoe is applied in this way, and is allowed to remain on, say for six weeks, the heels of the shoe, instead of exactly covering those of the foot, will be found to be a little within their outer margin and somewhat in front of their rearmost point. As the horn of the ground surface of

the foot is hardest on the outside and at the extreme end of the heels, the heel of the shoe in the case just described, will, as a rule, be more or less embedded in the comparatively soft horn invaded by it, with the probability of a corn being formed.

"The use of calkins may cause corns by localising, on the heels, the effects of concussion with the ground. In some rare cases, corns are produced by the horse treading on a stone or other hard body, which is a result that will very seldom occur if the sole be not 'thinned.' When the ground surface of the foot has been reduced too much, the sole may become bruised at any part pressed upon by the web of the shoe, especially, if the animal is worked at a fast pace and on hard ground. As previously mentioned, some horses have such weak feet that it is almost impossible to prevent them getting corns by any system of shoeing; for in their case, the concussion produced by the iron on the wall of the hoof at the heels, appears, when the animal is worked on hard ground, sufficient to set up an irritable state in the seat of corn, which condition will be manifested by more or less lameness, even when the characteristic red mark in the horn is not present.

"Narrow-heeled shoes which rest only on the wall at the heels, although recommended by some for the prevention of corns, are not, as far as I have seen, efficient for that purpose; for, by taking off the pressure on the bars, they throw too much weight on the wall, and hence are liable to set up irritation in the sensitive sole at the angle between the wall and the bars. If an ordinary shoe is used the web of the shoe at the heels should be broad so that the concussion received from the ground may be distributed over a large surface. In all cases the bars should be preserved intact. If the animal is peculiarly liable to corns, the seat of corn may be slightly eased off."

SYMPTOMS.—The lameness, which consists in a short, stilty, stumbling step is most apparent on hard roads and increases with exercise. When at rest the animal has a tendency to "point" the foot, with the heel slightly raised, toe resting on ground and limb bent. If there are corns on both feet there is alternate pointing or frequent change of the pointed foot. Although the lameness is not likely to be mistaken for navicular disease it is perhaps well to mention that, unlike navicular lameness, that from corns increases with exercise.

TREATMENT AND PREVENTION. — The spongy bruised horn should be pared away so as to allow any effusion or matter to be discharged. The spot should then be dressed with Friar's balsam, butyr of antimony or other antiseptic and hardening agent. It is essential that pressure should be kept off the part, and to insure this a horse with corns ought to be shod with slippers the heels of which should not extend beyond the quarters (see Fig. 56), or if only one heel is affected then a three-quarter shoe. (See Fig. 55.) In case of a corn discharging matter, after paring, the suppurating surface may be lightly cauterized with a red hot iron and afterwards treated with Stockholm tar, quicklime, carbolic powder or other antiseptic dressing. The parts should be kept dry, and on no account should "stoppings" of cow dung, clay or other softening material be used.

Laminitis or Founder.

The word laminitis means literally an inflammation of the laminæ or leaf-like structures which cover the sensitive parts of the foot and are interleaved with the horny laminæ lining the inner aspect of the wall. But,

while the laminæ are specially involved. the inflammation in most cases affects all the sensitive blood-vascular structures of the foot and the term "peditis" (foot inflammation) would more aptly describe the condition. The disease affects all classes of horses and although all shapes of hoof are liable, the predisposition to attack is strongest in the case of horses having wide flat feet with weak heels and flat soles. The two fore feet only are mostly affected. Sometimes all four feet are involved, but of the hind feet it is seldom that more than one is affected at a time.

Laminitis is one of the most painful affections that can be imagined because the inflamed structures are confined within a hard unyielding case of horn and there is consequently no room for the expansion of the swelling which accompanies the inflammation. The pressure upon the sensory nerves of the foot is therefore such as to give rise to excruciating pain, by which the grave constitutional symptoms which often accompany an attack are caused. Even in the early stages, or in mild cases when there is no actual inflammation but when the blood vessels are merely over-full or congested, the pain is very great and accounts for the peculiar

Fig. 57. Section through foot of horse—normal. (After Hayes.)

method of progression on the heels which will be described, and also for the great disinclination of the animal to move.

CAUSES.—The most common cause is concussion, especially when the circulation is weakened by over driving. Horses most frequently become foundered by being driven long journeys on hard roads when out of condition. When in this state the heart's action is weak and the circulation sluggish so that congestion of the blood vessels of the foot is easily brought about and inflammation supervenes.

Laminitis is also frequently associated with or occurs as a sequel to inflammation of the bowels, lungs and womb; and very often superpurgation, caused by an overdose of physic or the giving of purgatives when the bowels are in an irritable and colicky condition, is followed by an attack. In these cases the inflammation is said to "fly to the feet." The phenomenon of this change of situation is called "metastasis." What definitely determines the change is only vaguely understood but in this connexion it requires to be borne in mind that the mucous lining of the bowels, lungs and womb is continuous, through the skin, with the sensitive laminæ of the foot. A congestion in one part of a continuous membrane is apt to be transmitted to another part some distance away, as is well seen in irritation of the skin following indigestion in man. This crude statement of a generally accepted view regarding metastasis is supported by the fact that in laminitis so brought about it is only the sensitive laminæ that are involved and not the whole of the vascular structures of

the foot. It is when the bowel inflammation or the bronchitis or the inflammation of the womb is of a septic character that laminitis most usually supervenes and it is in these cases that all four feet are affected. Such metastatic cases are not unusual after a severe foaling in which the womb has been torn or inoculated with septic matter, or following on which there has been retention of the after-birth. They also sometimes follow on the giving of strong purgative medicines or the engorgement of the stomach with a full feed of wheat, oats or other expansile grain or meal.

Horses on shipboard often become foundered. In these cases the attack is induced by the want of exercise resulting in sluggishness of the circulation in the feet and a consequent tendency to congestion. Furthermore when large numbers are shipped there is the inability of the animal to lie down and so remove the strain on the sensitive laminæ caused by the weight of the animal. This strain is increased if the horse has overgrown hoofs and the whole of the weight has in consequence to be borne by the rim of the wall without any assistance from the sole. *Before shipping horses for a long voyage it is therefore a wise precaution to have them unshod*

Fig. 58. Section through horse's foot affected with chronic laminitis showing the deposit of exudate between the front of the pedal bone and the horny wall, whereby the front of the wall has become "dished" and the pedal bone pointed downwards. (After Hayes.)

and the wall rasped down to the level of the sole so that sole pressure can be assured. It is for the same reason—the insuring of sole pressure and the consequent lessening of liability to founder—that the provision of some yielding material, such as cocoa-nut matting, to stand on has in late years come into vogue when shipping valuable horses. This continuous strain on the feet may have something to do (in addition to metastasis) with the occurrence of laminitis as a sequel to chest diseases during which animals are always averse to lying down. It is certainly the cause of those attacks of founder affecting one foot, especially the hind, when the opposite foot or leg is injured or diseased in such a way as to prevent weight being borne by it. In all such cases the horse should be placed to stand on straw or other yielding surface or material and the weight-bearing foot should be left unshod and have the wall rasped down so that the weight can be distributed and borne by the sole, frog and wall equally.

One attack of laminitis always predisposes to a subsequent attack and with horses that have been foundered great care should be taken that they are not over-driven or subjected to inordinate concussion or other of the causes detailed. No matter how slight the attack, a horse that has suffered from laminitis is always to be considered as unsound.

SYMPTOMS.—In acute laminitis there are certain systemic symptoms of a febrile character, which assist materially to a diagnosis. The respiration

is quickened, the pulse is full, strong and frequent and there is often profuse perspiration. The feet are hot and there may be a slight depression or sinking above the coronet. In a few hours the coronets become full, the puffiness often extending as high as the fetlock and the arteries of the pastern throb in a manner easily felt on handling. When the fore feet only are affected the animal stands with them well in front of him and, resting upon the heels, the hind feet are placed very much forward so as to take as much weight off the fore ones as possible. It is a difficult matter to get the horse to allow one foot to be lifted because of the great pain caused when increased weight is put on the opposite foot. He is very much disinclined to move and when he is made to, he goes stiffly and on the heels. The weight is never brought forward over the toes on account of the great pain due to the compression of the inflamed laminæ and sensitive structures at the front part of the hoof. The action is always cramped and the want of freedom of movement gives rise to the impression amongst inexperienced observers that the muscles of the shoulder and chest are implicated, and this along with the distressed breathing promotes the idea that the animal is suffering from inflammation or congestion of the lungs. Hence the term "chest founder," a purely conjectural term, the condition which it is supposed to describe having no existence in fact.

Fig. 59. Horse's foot affected with chronic laminitis showing convexity of sole—"pumiced sole." (After Hayes.)

Fig. 60. Horse's foot affected with laminitis showing excessive heel-growth of horn with horn rings thickest at the heels. (After Hayes.)

When a foundered horse is made to back the action is very characteristic. He throws his body back with a swinging movement as if the feet were glued to the ground, and then draws or slides his feet after him. To turn round is a feat only accomplished with difficulty, and in effecting the turning movement the weight is kept on the heels all the time. At the onset of an acute attack the horse has a decided aversion to lying down but when once the feeling of relief, from the removal of the weight of the body off the feet, is experienced he will lie contentedly and easily and is often very much benefited by the consequent amelioration of the pain. When the hind feet are affected great difficulty is experienced in the attempt to pass urine, on account of the pain caused by placing the hind feet in position for staling. In such cases the urine should be drawn away at frequent intervals by means of a catheter.

On recovery from an acute attack of laminitis there frequently remains an abnormal condition of the foot which constitutes an unsoundness and which although not accompanied by actual lameness is always associated with a peculiarity of gait indicative of the previous disease. In both the walk and the trot the fore limbs appear to be advanced unduly or

thrown further forward than natural, and the heels always come to the ground first; this with the object of avoiding weight being put upon the toe, where there still remains some sub-acute inflammation and pain. At the same time the length of the step is shorter than usual although the exaggerated action gives the opposite impression. Another feature of lameness from laminitis is that the lameness increases with exercise whereas with some other diseases of the foot—navicular disease for instance—the lameness passes away when the animal is "warmed up."

There are also chronic changes in the shape of the hoof which are usually so well marked as to stamp the animal at once as having been foundered. These changes result partly from the original disease and partly from the manner of progression above described. At the time of the existence of the inflammation the swelling inside the hoof around the pedal bone causes pressure to be exerted on the front part of that bone

Fig. 61. Grass ring on horse's hoof. (After Hayes.)

whereby it is given a downward direction. (See Fig. 58.) The sole is consequently pressed downwards and becomes flatter than natural. In some cases the downward pressure of the pedal bone causes the sole to become convex and the condition known as "dropped sole" or "pumiced sole" is produced. (See Figs. 58 and 59.) On account of the fact that foundered horses "go on the heels" a more active growth of horn at the heels is induced and the heels therefore are deeper than normal. At the same time the front of the hoof instead of maintaining the natural straight contour from the coronet to the ground surface, becomes "dished" or concave in contour and the toe has a tendency to turn upwards. This increased growth of horn at the heels is intermittent and consequently there are produced a succession of rings round the hoof which differ from "grass rings" in that they are wider at the heels. (See Figs. 60, 62, and 63.) Often they may be one-half or three-eighths of an inch in thickness at the

heels and fade away to nothing at the front of the hoof. (*Note.* By a "*grass ring*" is meant a ring of more prominent growth of horn extending evenly all round the hoof and resulting from the more vigorous growth of horn which takes place when horses are turned out to grass for a spell. There are signs of ring-like growth of horn on most horses' hoofs. These result from the fluctuation of the vigor of horn growth corresponding to the varying activity of the growth of the coat at different seasons of the year). (See Fig. 61.)

TREATMENT.—The shoes should be immediately taken off, the rim of the wall rasped down level with the sole so as to take the strain off the inflamed sensitive laminæ by allowing the weight of the body to be partly borne on the sole. It is surprising how quickly relief from mechanical pain will follow on the provision of sole-pressure. The horse should then at once be placed in a foot-bath of cold water, in which he should be allowed to stand continuously until the acuteness of the pain subsides. At any rate, eighteen hours on end out of the twenty-four is not too long a time for the horse to be in the foot-bath, and if he is removed, the intervening six hours should be spent lying down. If he is averse to lying he ought to be forcibly put down by some quiet method. Failing a foot-bath or suitable stall in which one can be improvised, standing the horse in a stream or waterhole or dam, or even the bandaging of a trickling hose on to the limb above the feet may be resorted to; but, however it is done the water must be applied continuously and it must be cold.

This cold foot-bath treatment deserves to be strongly and unhesitatingly advocated, for, when it is applied in the early stages and persisted in,

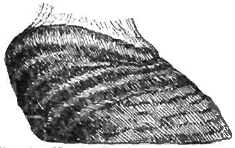


Fig. 62. Hoof showing laminitic rings and excessive growth of horn at heels. (After Dollar.)

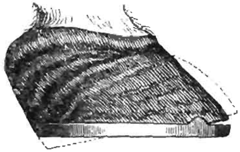


Fig. 63. Laminitic heels dressed to shape and shod. (After Dollar.)

it is seldom that recovery does not take place in a few days or that any permanent deformities or untoward sequelæ, such as follow on other methods of treatment, are experienced. Compared with this, hot fomentations, poulticing, bleeding at the coronet, and such like methods of treatment, are unsatisfactory and obsolete.

Some internal treatment is often necessary. When the fever is high a laxative dose of Epsom salts (six to eight ounces) may be given as a drench along with ten to twenty drops of tincture of aconite (Fleming's) or a small handful of salts and a dose of aconite may be added to the drinking water daily. The aconite is very useful in modifying the pain and distress when the irritative fever is acute. Strong purgatives should not be given as the artificial diarrhœa which they produce often tends to intensify the inflammation in the feet.

Food should be given but sparingly. It should consist of soft bran mashes and easily digestible green stuff with a little boiled linseed jelly every other day. A teaspoonful of bicarbonate of soda or saltpetre mixed with the mashes will assist in controlling the fever.

After the subsidence of the acute symptoms the treatment should consist in allowing spells of walking exercise three or four times a day—at first not more than a few hundred yards at a time, but increasing gradually until recovery is complete. When the lameness or tenderness in action persists the application of a fly blister (see page 75) round the coronets is often advantageous. A horse that has been foundered should always be shod flat with broad-webbed shoes and careful attention should be paid by the farrier when dressing the hoofs to the maintenance of its natural form. (See Figs. 62 and 63.)

Villitis.

Inflammation of the coronary band, from which the outer layer of the hoof wall is secreted, is called "Villitis." It is a form of lameness which occurs mostly in cart horses and is predisposed to by the practice of shoeing with calkins. The character of the lameness much resembles that of laminitis but the gait is a shuffling or gliding one. The wall of the hoof at the top near the coronet becomes dry and cracked, both vertically and horizontally, and ultimately may be likened to the roughened back of an aged tree (see Fig 64). Later on, as the diseased horn grows down the wall may break away.

Fig. 64 Hoof affected with "villitis" showing roughened and scaly horn growth. (After Hayes.)

TREATMENT.—Mild blisters applied round the coronet will assist in promoting a more healthful growth of horn. Oily dressings may be applied to the hoof to minimize the tendency of the horn to crack and split.

Navicular Disease.

This is one of the few diseases which has no regularly used common name. The terms "grogginess" or "groggy" are sometimes used but they have reference to the character of the action of horses suffering from the disease. The word "Navicular" means boat-shaped (L. *navis*—a ship) and refers to the shape of the small shuttle-like bone situated inside the hoof at the back of the coffin or pedal bone over which the main flexor tendon of the foot (*flexor pedis perforans*) passes before it is inserted to the under surface of the pedal bone. (See Figs. 57 and 65.)

NATURE AND CAUSATION.—The pathology of navicular disease was for a long time obscure; and now while its characteristics are well understood

its causation stands in needs of more elucidation in many aspects. When affected with navicular disease the surface of the bone over which the tendon plays becomes inflamed and ultimately affected with *caries* or bone ulceration. The ulcers are often two in number, one situated on each side of the middle line of the bone (Figs. 66 to 70). Some authorities state that the disease commences in the tendon and extends to the bone and that the tendon becomes lacerated, but throughout numerous *post-mortem* examinations the author has never seen this. He consequently inclines to the view that the disease originates in the bone, or in the pad of fibro-cartilage covering that surface of the bone over which the tendon plays, and has as a cause, that concentration of pressure and concussion at this particular spot which occurs in horses having a particular conformation of hoof and pastern—the narrow upright hoof and vertical pastern. Horses with oblique pasterns seldom have navicular disease and it practically never occurs in the hind feet where the concussion is less but where the strain on the tendon is just as great as in the fore. Neither is navicular disease at all common where horses are not used on hard roads. Although it is yet by no means so common an

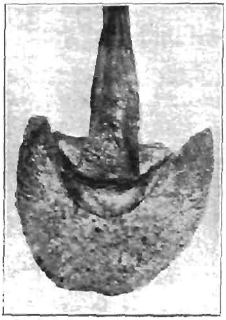


Fig. 65. Inferior aspect of pedal and navicular bones showing tendon passing upwards over latter. (After Hayes.)

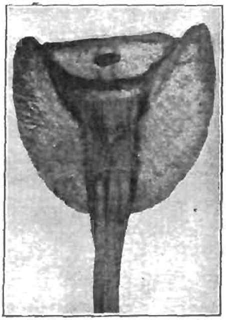


Fig. 66. Inferior aspect of pedal and navicular bones with tendon drawn back to show ulceration on navicular bone. (After Hayes.)

affection as in England, it is a gradually increasing quantity in the cities and towns of Australia. It was seldom met with even among Melbourne horses until the early nineties. Its increase in the cities has been concurrent with the extension of wooden paving and macadamizing of the thoroughfares. This observation strengthens the conclusion that, in horses hereditarily predisposed to it by particular conformation of hoof and pastern, concussion plays the chiefest part in its causation.

Excessive paring of the frog, by which, in shod horses, that anti-concussive pad is prevented from contacting the ground, greatly increases the jar on the navicular bone and is therefore a fertile contributory cause of navicular disease. This practice of mutilating the frog—a practice which is fortunately gaining disrepute amongst farriers—prevents the performance of two of its most important functions, viz. :—the lessening of concussive

shock and the providing of an elastic impetus to the elevation of the foot; and the suspension of these functions is a considerable factor in the causation of navicular disease. In Norway and Sweden this disease is almost unknown and the immunity is ascribed to the fact that in these countries horses are never shod with heels or calkins—as horses working at any pace beyond the walk never should be shod.

Rheumatism sometimes settles in the navicular bone and causes navicular disease. In such cases there is no ulceration of the bone but a porcelainous matter is deposited in it.

The age period of navicular disease is from five years onwards.

SYMPTOMS.—As a rule this disease affects only light-bred horses having naturally undersized and narrow or "muley" feet. When the disease is well advanced the heels become contracted or "wired in" and the frog and hoof generally present a shrunken appearance; this, apart from the natural narrowness of the hoof to begin with.

The most characteristic feature of this form of lameness in the usual run of cases is "pointing" described on page 212. (See Fig. 71.) This sign may be noticed for perhaps months before actual lameness is observed. Pointing is also habitual in lameness from corns but in that case the heels are flat and expanded rather than upright and contracted.

Figs. 67 to 70. Navicular bones (inferior aspect) showing various stages in the process of ulceration constituting navicular disease.

The horse may appear to walk sound but lameness is pronounced at the trot. It is most marked when the horse is first moved from the stable in the morning and, unlike the lameness of laminitis or corns, it may disappear after he has become warmed up at exercise. When put to a trot the animal goes with a tripping, yet cautious, gait stepping short and on the toes, in consequence of which the toe of the shoe is always the part most worn. The lameness is always more pronounced on hard ground and when the horse is ridden. The horse appears afraid to go down hill, and when doing so the lameness, and the gingerly "cat on hot bricks" style of gait, is very distinct on account of him trying to avoid putting weight on the heels.

A new *mechanical method of detecting navicular disease* has recently been practised in France. It is based upon the principle that when the navicular bone is subjected to pressure from the contraction of the tendon passing over it there will be flinching from the pain caused. The horse is made to stand with the suspected foot on a wedge of hard wood, about

8 in. by 6 in., sloping backwards at an angle of about 18 deg. so that the toe is elevated. The tendon is by this means put upon the stretch and causes pressure on the navicular bone, which pressure will be increased if the opposite foot is lifted. On this being done if the horse is affected with navicular disease he shows acute pain and endeavours to get away. Some horses may show discomfort from the position in which the foot is placed, apart from the presence of pain and it is therefore prudent to make a comparison with the same method on the opposite foot.

The disease seldom occurs in horses under five years old. It is slow in developing and many of the characters above described are so gradually manifested as to render the diagnosis a matter of very great difficulty. The negative evidence afforded by the absence of other causes of lameness is of value in coming to a conclusion but oftentimes it will be found more satisfactory to apply the cocaine test as described on page 58.

A horse affected with navicular disease is always a dangerous animal to ride, on account of his great liability to stumble. He is apparently afraid to lift his feet to a sufficient height to avoid stumbling, because of the fact that the higher the foot is raised the greater is the shock on the heels, and the greater therefore is the pain experienced, when the heels are brought to the ground.

Fig. 71. Attitude when "pointing."

TREATMENT.—When navicular disease is suspected, some good may be done towards arresting its progress by removing the shoes and rasping the ground surface of the wall so as to give frog pressure before turning the horse out for a spell on soft lowland pasture. But once the disease is established no treatment has yet been suggested that has any curative effect. The palliative effect of blistering round the coronet is evanescent.

The lameness may be modified somewhat by shoeing with a broad- and thick-heeled shoe, but for its complete removal the only method of any value is the operation of neurectomy (see page 68). This operation (the cutting out of portion of the sensory nerve of the foot) will enable a horse with navicular disease to be used for a considerable time but it does not stay the progress of the disease. It merely removes the lameness and by obliterating the pain renders the horse less liable to stumble and therefore safer to ride. A horse operated on by the author some years back was regularly hunted for three seasons afterwards and seemed good for another three until one day he unexpectedly flung off one of his hoofs and had to be destroyed.

For other diseases of the foot—those in which the cause of lameness (if any) is obvious—see chapter on Diseases of the Foot.

(*To be continued.*)

THE ORCHARD.

James Lang, Harcourt.

Pruning will require to be pushed on with all speed during the month. In pruning young trees, regard should always be given to shape. Three branches are enough to start with; these will form the foundation, and subsequent branches should radiate as nearly as possible at equal distances apart, so as to form a well balanced tree. In pruning the main branches, remove about two-thirds of the growth and cut back to an outside bud, leaving one-third to form the future branch.

Where an orchard is in an exposed situation and subject to strong winds blowing from the one direction, trees are apt to grow one-sided. This should be counteracted as much as possible when the trees are young by pruning to an outside bud on the windy side, and to an inside bud on the lee side, and so throw the tree against the wind. Good judgment will be required in cases like this, but always have in view that your trees should be well balanced; nothing looks worse in an orchard than to see trees leaning to one side.

Old trees should be regulated by having some of their branches cut out where they are rather close; this allows a free circulation of air, and is also an advantage in spraying. Fruit spurs on old trees should be judiciously thinned out and shortened back; this will allow the trees to bear a much better quality of fruit than in cases where this treatment is neglected.

Tree planting should also be pushed on. In selecting the varieties of apples and pears for planting, preference should be given to export varieties, as we must look now to our export trade to make fruit-growing remunerative. Jonathan, Cleopatra, Munroe's Favorite, Newtown Pippin, Esopus Spitzenberg, London Pippin, Rome Beauty, Sturmer Pippin, and Dumelow's Seedling, are the best varieties, and bring the most remunerative prices. In pears, Winter Nelis, Josephine de Malines, Glou Morceau, Beurre Clairgeau, Beurre d'Anjou, Beurre Diel, and Vicar of Winkfield, are the best.

It is a matter for congratulation that pears have carried well this season, very few being returned as rotten. This is in striking contrast to the experience of other years, when the bulk was returned as rotten and wasty; it points to more care being exercised by the shipping companies, who now generally allot a small chamber for the carriage of pears at a lower temperature than for apples. The prices realized this season will encourage growers to ship pears on a much larger scale than has hitherto been the case.

All kinds of small fruits should now be planted. Strawberry plantations that have been more than three years planted should be renewed.

Artificial Manures Acts.

SUPPLEMENTARY LIST OF UNIT VALUES OF MANURES IN THE MELBOURNE MARKET DURING THE SEASON 1907.

Description of Manure.	Potash.	Estimated Total Value of Manure per ton.	Price asked for Manure per Ton. Delivered at Local Railway Station.	Where Obtainable.
Mainly Potassic.	Percentage.	£ s. d.	£ s. d.	
Muriate of Potash (Chloride)	59.25	16 5 10	13 7 6	Messrs. Wischer and Co. Propy. Ld., Melbourn
Sulphate of Potash	51.05	14 0 9	13 12 9	" " " " " "

Description of Manure.	Moisture.	Nitrogen.		Phosphoric Acid.								Estimated Total Value of Manure per ton.	Price asked for Manure per ton. Delivered at Local Railway Station.	Where Obtainable.
				Water Soluble.		Citrate Soluble.		Insoluble.		Total.				
	Percentage.	Percentage.	Estimated value in one ton of the manure.	Percentage.	Estimated Value in One ton of the Manure.	Percentage.	Estimated Value in One ton of the Manure.	Percentage.	Estimated Value in One ton of the Manure.	Percentage.	Estimated Value in One ton of the Manure.			
Mainly Phosphoric, but containing Nitrogen, also Phosphoric Acid, readily soluble.			£ s. d.		£ s. d.		£ s. d.		£ s. d.		£ s. d.	£ s. d.	£ s. d.	
Superphosphate and Bonedust Mixed, No. 1	8.47	2.49	1 5 6	10.76	2 8 5	1.97	0 7 11	9.84	1 9 6	22.57	4 5 10	5 11 4	5 5 0	Messrs. Wischer and Co. Prop. Ld., Melbourne
Superphosphate and Bonedust Mixed, No. 2	10.67	1.10	0 11 3	14.65	3 5 11	1.77	0 7 1	5.74	0 17 3	22.16	4 10 3	5 1 6	5 0 0	" " " "
Nitro-Superphosphate (as blood)	9.98	1.76	0 19 4	16.19	3 12 10	0.77	0 3 1	2.79	0 8 4	19.75	4 4 3	5 3 7	5 10 0	" " " "

SUPPLEMENTARY LIST OF UNIT VALUES OF MANURES IN THE MELBOURNE MARKET DURING THE SEASON 1907—*continued.*

Description of Manure.	Moisture.	Nitrogen.		Phosphoric Acid.		Mechanical Condition.						Estimated Value of Manure per ton.	Price asked for Manure per ton. Delivered at Local Railway Station.	Where Obtainable.
								Nitrogen.		Phosphoric Acid.				
Containing Phosphoric Acid and Nitrogen. Phosphoric Acid difficultly soluble.	Per-cent-age.	Per-cent-age.	Estimated Value in One ton of the Manure.	Per-cent-age.	Estimated Value in One ton of the Manure.	Per-cent-age in Fine Bone.	Per-cent-age in Coarse Bone.	Per-cent-age in Fine Bone.	Per-cent-age in Coarse Bone.	Per-cent-age in Fine Bone.	Per-cent-age in Coarse Bone.			
			£ s. d.		£ s. d.							£ s. d.	£ s. d.	
Indian Bonemeal	5.35	3.25	1 10 11	23.92	3 11 9	..	100.00	..	3.25	..	23.92	5 2 8	6 0 0	Messrs. Wischer and Co. Prop. Ld., Melbourne
The Echuca Bone	3.83	3.31	1 12 11	19.79	3 5 3	30.00	70.00	1.00	2.31	5.94	13.85	4 18 2	5 5 0	Messrs. Boyle, Williams, and Henderson, Echuca
Bonedust	7.39	3.70	1 17 2	22.45	3 15 10	37.70	62.30	1.39	2.31	8.46	13.99	5 13 0	6 0 0	J. R. Sporn, Nhill
"	5.70	3.77	1 16 5	22.26	3 9 1	10.00	90.00	0.37	3.40	2.22	20.04	5 5 6	5 0 0	Bray and Sons, St. Arnaud
"	5.80	3.72	1 16 11	20.70	3 7 9	27.50	72.50	1.02	2.70	5.69	15.01	5 4 8	6 0 0	J. Little and Son, Ararat

Description of Manure.	Moisture.	Nitrogen.		Phosphoric Acid.								Potash.		Estimated Total Value of Manure per ton.	Price asked for Manure per ton. Delivered at Local Railway Station.	Where Obtainable.
				Water Soluble.		Citrate Soluble.		Insoluble.		Total.						
Mixed Manures, containing Nitrogen, Phosphoric Acid, and Potash.	Per-cent-age.	Per-cent-age.	Estimated Value in One ton of the Manure.	Per-cent-age.	Estimated Value in One ton of the Manure.	Per-cent-age.	Estimated Value in One ton of the Manure.	Per-cent-age.	Estimated Value in One ton of the Manure.	Per-cent-age.	Estimated Value in One ton of the Manure.	Per-cent-age.	Estimated Value in One ton of the Manure.			
			£ s. d.		£ s. d.		£ s. d.		£ s. d.		£ s. d.		£ s. d.	£ s. d.	£ s. d.	
Ohlendorff's Dissolved Peruvian Guano	3.67	4.89	3 8 7	7.72	1 14 9	2.33	0 9 4	0.88	0 2 8	10.93	2 6 9	0.52	0 2 10	5 18 2	13 5 0	Messrs. Gibbs, Bright, and Co., Melbourne
Key Fertilizer ..	10.73	..	..	15.75	3 10 10	2.51	0 10 0	2.79	0 8 4	21.05	4 9 2	2.81	0 15 5	5 4 7	5 10 0	Messrs. Wischer and Co. Prop. Ld., Melbourne

W. PERCY WILKINSON,
Government Analyst for Victoria, and Acting Chemist for Agriculture.

Government Laboratory,
Melbourne, 1st June, 1907.

Artificial Manures Acts.

LIST SHOWING RESULTS OF ANALYSES OF SAMPLES OF ARTIFICIAL MANURES COLLECTED IN THE STATE OF VICTORIA UNDER THE PROVISIONS OF THE ARTIFICIAL MANURES ACTS.

Label Number.	Official Number.	Description of Manure.	Manufacturer or Importer.	Moisture.	Nitrogen.		Phosphoric Acid.								Average Net Weight Found.	Net Weight Guaranteed.	Estimated Value per Ton.
					Found.	Guaranteed.	Water Soluble.		Citrate Soluble.		Insoluble.		Total.				
							Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.			
				%	%	%	%	%	%	%	%	%	%	%	lbs.	lbs.	£ s. d.
96	19368	No. 1 Superphosphate	Mt. Lyell Mining and R. Coy.	10.28	..	..	19.54	19.00	0.42	1.00	1.97	1.00	21.93	21.00	224	224	4 11 7
38	18841	" " "	" " "	10.62	..	..	19.96	19.00	0.77	1.00	0.92	1.00	21.65	21.00	*	224	4 13 10
50	18964	" " "	Mt. Lyell Mining and R. Coy., Melbourne	11.18	..	..	19.80	19.00	0.74	1.00	1.46	1.00	22.00	21.00	222	224	4 13 6
57	18970	" " "	" " "	9.68	..	..	19.79	19.00	0.98	1.00	1.03	1.00	21.80	21.00	215	224	4 14 0
47	18988	" " "	" " "	8.87	..	..	20.30	19.00	0.61	1.00	1.89	1.00	22.80	21.00	222	224	4 15 8
71	19052	" " "	" " "	7.75	..	..	20.08	19.00	0.77	1.00	0.85	1.00	21.70	21.00	224	224	4 14 3
78	19055	" " "	" " "	12.29	..	..	19.90	19.00	0.56	1.00	1.42	1.00	21.88	21.00	*	224	4 13 3
85	19111	" " "	" " "	8.89	..	..	20.45	19.00	0.61	1.00	0.65	1.00	21.71	21.00	218	224	4 15 1
229	19265	" " "	" " "	11.83	..	..	20.29	19.00	0.58	1.00	1.57	1.00	22.34	21.00	221	224	4 15 2
93	19267	" " "	" " "	11.72	..	..	21.40	19.00	0.60	1.00	1.14	1.00	23.14	21.00	222	224	4 19 0
90	19272	" " "	" " "	9.62	..	..	19.65	19.00	0.46	1.00	2.36	1.00	22.47	21.00	225	224	4 12 7
31	18817	Florida Superphosphate	Messrs. Cuming, Smith, and Co., Melbourne	11.53	..	..	19.64	19.00	1.54	1.00	0.79	1.50	21.97	21.50	227	224	4 15 4
82	18966	" " "	" " "	10.00	..	..	19.06	19.00	2.16	1.00	2.18	1.50	23.40	21.50	221	224	4 16 7
76	19031	" " "	" " "	7.87	..	..	19.95	19.00	0.05	1.00	1.90	1.50	21.90	21.50	224	224	4 11 10
73	19054	" " "	" " "	11.45	..	..	19.40	19.00	0.43	1.00	1.85	1.50	21.68	21.50	225	224	4 10 10
79	19097	" " "	" " "	11.73	..	..	19.95	19.00	0.22	1.00	1.43	1.50	21.60	21.50	224	224	4 12 1
95	19113	" " "	" " "	10.24	..	..	20.50	19.00	0.51	1.00	0.67	1.50	21.68	21.50	216	224	4 14 11
234	19258	" " "	" " "	11.60	..	..	19.10	19.00	0.80	1.00	1.70	1.50	21.60	21.50	222	224	4 10 9
97	19268	" " "	" " "	11.21	..	..	19.00	19.00	0.99	1.00	1.58	1.50	21.57	21.50	225	224	4 11 1
39	18870	Special Superphosphate	Messrs. Wischer and Co., Melbourne	6.80	..	..	20.40	20.00	1.40	1.00	0.88	1.00	22.68	22.00	225	224	4 18 3
40	18871	" "	" " "	7.17	..	..	20.90	20.00	0.64	1.00	2.06	1.00	23.60	22.00	226	224	4 18 7
41	18872	" "	" " "	7.10	..	..	20.33	20.00	0.14	1.00	2.59	1.00	23.06	22.00	227	224	4 14 7

65	18072	Superphosphate ..	Messrs. Wischer and Co., Melbourne	7.54	..	..	20.40	19.00	0.80	1.00	0.50	1.00	21.70	21.00	218	224	4 15 6
49	18989	" " ..	" " "	5.81	..	..	19.00	19.00	0.48	1.00	2.08	1.00	21.56	21.00	227	224	4 9 6
74	19100	" " ..	" " "	7.60	..	..	19.00	19.00	0.23	1.00	2.35	1.00	21.58	21.00	223	224	4 8 9
243	19259	" " ..	" " "	8.43	..	..	20.50	19.00	0.16	1.00	1.59	1.00	22.25	21.00	219	224	4 14 6
244	19266	No. 3 Superphosphate	" " "	11.89	..	..	18.50	17.00	1.06	0.75	2.07	0.75	21.63	18.50	220	224	4 9 7
51	18965	Ordinary Superphosphate, Federal	Australian Explosives and Chemical Coy., Melbourne	5.90	..	..	19.80	18.00	0.71	1.50	1.70	1.50	22.21	21.00	219	224	4 13 7
60	18997	" " "	" " "	6.34	..	..	19.70	18.00	1.28	1.50	0.88	1.50	21.86	21.00	220	224	4 14 8
70	19096	" " "	" " "	8.72	..	..	18.47	18.00	2.75	1.50	1.23	1.50	22.45	21.00	225	224	4 15 4
83	19105	" " "	" " "	8.40	..	..	19.05	18.00	0.98	1.50	1.11	1.50	21.14	21.00	222	224	4 10 10
86	19367	" " "	" " "	8.71	..	..	19.50	18.00	0.50	1.50	1.27	1.50	21.27	21.00	221	224	4 11 0
56	18991	No. 1 Superphosphate	Colonial Manures Coy., Melbourne	12.00	..	..	17.52	17.50	1.51	1.00	0.67	..	19.70	18.50	224	224	4 5 6
82	19103	" " "	" " "	13.47	..	..	16.35	17.50	1.09	1.00	0.26	..	17.70	18.50	230	224	3 18 2
72	19053	Superphosphate, Standard Flag Brand	Renard Fertilizer Coy., Melbourne	7.47	..	..	15.64	17.00	3.07	2.50	0.47	0.50	19.78	20.00	224	224	4 5 7
94	19107	" " "	" " "	6.83	..	..	16.05	17.00	2.20	2.50	1.32	0.50	19.57	20.00	216	224	4 2 4
87	19112	" " "	" " "	6.64	..	..	16.53	17 00	2.49	2.50	0.97	0.50	19.99	20.00	214	224	4 5 4
98	19098	Dissolved Bones " ..	Cuming, Smith, and Co., Melbourne	9.34	1.04	1.00	11.52	10.01	2.24	3.88	9.79	5.48	23.55	19.37	223	224	5 2 2
100	19257	" " ..	" " "	12.57	0.91	1.00	9.96	10.01	2.50	3.88	8.71	5.48	21.17	19.37	221	224	4 11 7
75	19033	Nitro Superphosphate	Mt. Lyell Mining and R. Coy., Melbourne	11.87	1.62	1.60	16.65	16.00	1.05	1.00	1.17	0.75	18.87	17.75	221	224	4 10 2
52	18968	Bonedust and Superphosphate, No. 1	" " "	8.50	1.23	1.30	13.39	13.50	2.92	3.75	6.65	4.50	22.96	21.75	216	224	5 4 5
84	19106	" " "	" " "	6.24	1.19	1.30	15.33	13.50	0.95	3.75	6.92	4.50	23.20	21.75	216	224	5 5 8
45	18876	Bone and Super Mixture, Standard Flag Brand	Renard Fertilizer Coy., Melbourne	7.92	1.05	0.90	13.12	12.75	2.41	4.25	4.56	2.31	20.09	19.31	225	224	4 13 1
99	19099	" " "	" " "	7.34	0.98	0.90	11.39	12.75	1.41	4.25	7.55	2.31	20.35	19.31	*	224	4 0 7
43	18874	Bonedust and Superphosphate	J. A. Dundas, Dynon-road, Footscray	7.96	1.28	1.50	3.88	6.12	5.59	8.26	8.13	2.82	17.60	17.20	112	112	3 17 5
81	19104	Thomas "Star" Phosphate and Superphosphate	The Colonial Manures Coy., Melbourne	4.02	..	..	4.01	6.00	11.46	12.00	3.24	1.00	18.71	19.00	224	224	3 13 7

* Samples not weighed.

W. PERCY WILKINSON,
Government Analyst for Victoria, and Acting Chemist for Agriculture.

Government Laboratory,
Melbourne, 13th June, 1907.

WATTLE GROWING.

A. Tatham, Gisborne.

Wherever the black wattle (*Acacia decurrens*) grows naturally in Victoria, it is possible to cultivate it. On most properties there is always an acre or two of land that for some reason or other yields no return, and there is no reason why they should not be made to do so through wattles.

CULTIVATION.

It would be difficult to find a soil in Victoria that would not grow this tree, provided moisture was sufficient. But if any can be specially selected perhaps the granite country would gain first place. Those soils that are rich in humus are most favored, and often in granite localities, where the soil surface is made fairly free by the disintegration of the rocks, a dense vegetation of low-growing species, especially bracken fern, is found, causing an annual deposit of decaying vegetable matter. The wattle in its young state is tolerant of shade, and in fact thrives well in partial shade, or under a high leaf canopy. But to be at its best as far as bark production is concerned it should have no overhead shade, but plenty of undergrowth. Its natural locality is a valley, but where the rainfall is 30 inches and over it is found growing well on ridges.

The wattle seeds profusely once in three years. To collect the seeds, the pods should be gathered just as they ripen, but before they open, as they will do on a hot day, and so shed the seed. The pods can be laid on sacks or rick cloth in the sun, where they get brittle or split; place all in a sack and beat it briskly with a stout stick, and the seed will be threshed out. If the sack is held up, and gently bounced on the ground it will be found that the seeds sink to the bottom and can easily be collected.

The area having been selected, the seed can be sown any time in the early autumn. The cheapest and easiest way to do this is to strive to get a locality that has trees growing on it; if bracken fern exists all the better. Do not attempt to remove any rubbish in the shape of logs or dead limbs, leave all alone—it is an excellent site for wattles. Before the autumn rains, throw the seed broadcast over the area; it requires no previous preparation, if plenty of dry vegetation is present.

Half-a-pound of seed is ample for an acre, in fact a quarter of a pound will suffice, but is difficult to sow, except it is mixed with a bucket of sand or earth. On a favorable day, and with due regard for yourself and your neighbours, set fire to the block. The heat of the fire will assist germination, and the resulting ashes are sufficient cover for the seeds; injurious insects are destroyed, and the vegetation is burnt sufficiently to allow the young wattles to get a fair start in life, before they have to struggle through the quick growth of grass, &c., which will follow in the spring. In two years, the young wattles will be 2 to 3 feet high and beyond all interference from undergrowth.

So far the expense has been very slight. But as stock will greedily devour wattles the plantation must be fenced until such time as the young trees are too high for them, which ought to be in their fourth year. The style of fence need only be temporary and cheap, but effective.

If this style of plantation cannot be arranged, then more expensive methods must be resorted to. The next cheapest is to run disc cultivators

over the area where possible, throw on the seed broadcast, and then brush harrow it in or roll it. But the seed needs preparation; quick germination cannot be hoped for unless it has been subject to heat, soakage, or fermentation. To heat seed, place it in a hot oven and as soon as it gets fairly hot remove it; this will keep for some time should rain not fall. Soaked seed is too tender to handle much and is only of use in seed beds, and should rain not fall after sowing it would perish. If land that has been broken up by ploughing can be secured it generally grows good wattles. Even ploughed-in seed has resulted in a good plantation, but is expensive.

It is almost useless to grow wattles in plain country where trees have not previously grown, as they will require attention of an expensive nature to insure success. Above all strive to grow them in scrubby areas, do not ring or destroy the natural growth except where it greatly interferes with the young trees. As a rule wattles grown in the open suffer severely from insect pests and blight, and the want of sufficient humus in the soil checks their growth. These trees are as a rule of low growth, thin and hard in the bark, and as often as not cannot be stripped. The only way to remedy this evil if the soil is hard, is to break it up previous to sowing. On no account overcrowd the trees; the object to be aimed at is marketable bark and as much of it as possible. The only way to get this is by having large stemmed and big branched trees. If the trees are crowded they will only grow lanky and thin, and thinning operations will have to be resorted to. If this is not done carefully the remaining trees will, through the weight of their crowns, often bend over and even get torn out of the ground; they are so weak that a gale of wind will level them. From the first, keep them well apart, and the after results will well repay this precaution, besides saving the cost of thinning.

Lopping of branches may be resorted to, but no tree under 6 feet high needs it. It is after this height has been attained that a few branches may be removed; do not lop right up, rest content to remove a few only at a time. It is advisable not to lop any tree higher than 10 feet; the branches that grow beyond this are needed and will of themselves produce both quality and quantity of bark. Above all cut close to the stem, do not leave a stub sticking out. It is necessary that the wound should heal quickly, in order to prevent the inroads of borers or fungus disease; it cannot heal properly as long as the dead bit of branch sticks there. Then again, when stripping takes place these stubs are a cause of trouble and annoyance, preventing the easy removal of the bark. An acre of well grown wattle trees ought not to number more than 150, and, if grown in scrub, probably half this number. It is a great mistake to suppose that more trees will return a better profit. It is more than probable that an acre of 150 trees will produce more bark, and distinctly better quality, than an acre of 500 whipsticks that can only produce thin, inferior bark.

The greatest enemy to wattles is fire; at no period of their lives can they be considered safe, should this element attack them. In most cases it kills them, and if not, so injures them that the bark is useless for stripping; therefore beware of fire.

HARVESTING THE BARK.

At what age a tree is fit to strip depends on a lot of circumstances; but it can be taken as a rough guide, that with favorable seasons and growth 6 to 8 years will be the youngest age conducive to a decent bark

yield. It is possible to strip at 4 years, but the return is a poor one compared to what would result if the tree was left another couple of seasons.

There is a time when the marketable bark reaches its maximum thickness; this is probably between 8 and 10 years in a normally grown tree, it may be even a little later. After this stage has been reached, the green bark will never get thicker, any increase in thickness will only be due to the accumulation of dead bark that adheres to the stem and covers the live bark, or marketable commodity. Now it stands to reason a purchaser is not going to buy dead bark, and to market such rubbish would be folly. Therefore as soon as the bark of a tree shows signs of external cracking and dying, no time should be lost in stripping it, for it will never improve, but only recede in value.

There are many different ways of stripping bark, but whatever method is adopted, the object in view should not be most bark with least trouble and time, but most bark and best sample. If a tree is carefully worked, it is surprising what a lot of good quality material it yields. But the best bark is often ruined by carelessness. Even inferior bark can be made to appear good, with a little care. It should be cut to one length, not doubled over in the bundles, because the bent bark takes up more room, is very prone to spring and loosen the ties, and looks slovenly. After the bark is stripped, great care must be taken to prevent it getting wet or a great loss of tannin will result. Freshly peeled bark suffers more in this way than dry bark. But when dry bark gets damp, especially when bundled, it is liable to be attacked by mildew. This is often hard to detect till perhaps great injury is caused; mildewed bark is practically valueless. Therefore do not bundle any but dry bark, and if stored, be careful it gets plenty of air, but no damp. Above all keep the bark clean, good appearance goes a long way towards a good price.

RETURNS.

It would be difficult to state here what the probable cost per acre, or of marketing per ton, might be. Some acres would require little outlay until stripping, others might be a long way from a market. But if the probable returns can be arrived at, then the question simplifies itself to those who wish to give it a trial. From calculations based on some years' stripping, it has been found that 30 trees supposed to be between 6 and 8 years old produced a ton of dry bark. The trees were naturally grown, in bush country. Therefore an acre of 150 trees 8 years old and fairly grown ought to produce five tons. Now taking the average price of bark in Melbourne at £6 per ton, an acre would yield £30 in 8 years. Allowing only two tons to the acre the return of £12 would be satisfactory, as the land in its natural state as a grazing area would only be worth about 2s. per acre per annum. It cannot be denied that £30 per acre at the end of 8 years, even though it be reduced by half to cover cost of all works connected with the plantation, is better than 16s. per acre as a grazing area.

There are many blocks of suitable land lying idle in Victoria to-day that could be made to return a good income from this source, with absolutely no more cost than sowing the seed and harvesting the bark. South Africa is planting large areas of wattle. Why is it neglected in the country of its origin?

GARDEN NOTES.

J. Cronin, Inspector Vegetation Diseases Acts.

The Iris.

Iris is a genus of bulbous and herbaceous plants found native in various parts of Europe, Asia, Africa, and America. There is a large number of species, many of which have been cultivated in European gardens for centuries, and from which garden forms that are superior in many ways to the types from which they originated have been raised by intercrossing and selection. The types being so numerous, and the geographical distribution so wide, flowers of some species or varieties of iris may be

IRIS STYLOSA ALBA.

IRIS FLORENTINA PURPUREA.

seen in bloom at almost any season of the year, and under most varying conditions. Some kinds require a warm dry situation, with abundance of light and sunshine, while others are denizens of swamps, and require moist and shaded conditions to bring them to perfection. The flowers of most species are very beautiful, and are extensively used for decoration in Europe, where, in addition to the varieties grown in the flower garden, bulbous kinds are grown in pots and forced into flower prematurely in heated glass houses. Orris root, used in medicine and perfumery, is derived from *Iris florentina* a species worthy of culture as a garden plant.

Irises are divided into several sections, but for the purpose of these notes it is sufficient to mention the principal groups only. The most generally grown in this State are the Flag irises (*Iris Germanica* and its

varieties), in which are included other types and their hybrids. The chief characteristics of this group are:—The foliage is broad and in most varieties dwarf, rising from a creeping root-stock or rhizome, and the flowers large, generally blue, purple, and white in colour. They are all hardy and will thrive in almost any situation. Flowers of this section are produced in spring. The Japanese iris (*I. Kæmpferi*) is fibrous rooting, and produces tufts of foliage 3 or 4 feet in height when well grown, above which the large distinct flowers are borne during summer. There is a greater range of colour in this, than in any other section. It grows to perfection when planted beside water-courses and in other other damp places, but will also thrive fairly in ordinary borders if the soil is of a loamy nature. It may be seen blooming during the summer months in the mixed groups and borders at the Melbourne Botanic Gardens. The Director of the Gardens, Mr. W. R. Guilfoyle, has caused irises of various species to be planted in almost all conceivable situations, and has succeeded in producing fine plants that bloom freely in most unlikely places.

The Spanish and English irises (also known as *Xiphions*) with other species, including reticulatum alatum and junceum, are true bulbous plants that produce their flowers during spring and summer. In the so-called English irises, the original types of which are natives of Spain and Portugal, the colours of the flowers are white and purplish shades; while the flowers of the Spanish irises are yellow, bronze, white, and lilac in colour. The foliage of this class is usually narrow and rounded.

The irises are plants worthy of much more extended culture in this State, being in most cases very hardy and easily grown—thriving without artificial watering. They produce beautiful flowers, which are excellent for general decorative purposes, and totally unlike those of any other hardy plant.

SOIL—SITUATION—CULTURE.

The Flag iris will succeed in almost any kind of soil, that of a loamy nature being most suitable. No manure is required unless the soil is very poor and shallow, when some well rotted cow or stable manure should be incorporated. Good drainage and sunny positions should be provided. The plants are increased by divisions of the root stock. A piece of the parent plant may be cut off with roots attached, and planted at about the same depth as originally occupied; the bare covering of the creeping shoot—as it really is—being sufficient. The soil should be firmly pressed and afterwards watered as in the case of planting out generally. After culture is mainly cleaning and weeding. *I. Kæmpferi* is an example of herbaceous iris with fibrous roots, and is propagated by dividing the parent crown or tuft. This class requires a cool moist soil, and grows to perfection in some of the gardens and nurseries at Upper Macedon. While damp, or even wet situations are suitable, it must not be assumed that they will succeed in sour soil. They will endure abundance of moving water, but not that which is stagnant. Divisions of the fibrous rooting kinds may be planted during autumn or early spring.

The bulbous section should be planted in autumn in well drained and rather light soil. They are increased from offsets of the bulbs. The bulbs should be planted at a depth of 4 to 6 inches, and about 4 inches apart to allow for multiplication. They are most effective in the garden when planted in large patches, and may be allowed to grow undisturbed for three or four years.

SELECTION OF VARIETIES.

A number of varieties of many of the types undermentioned are available in Melbourne, from the nurserymen or seedsmen. Iris Germanica, many varieties; Kæmpferi, many varieties; fimbriata, florentina, pavonia—the peacock iris; Xiphium—Spanish iris, many varieties; Xiphioides—English iris, many varieties; ochroleuca, pallida, reticulatum; stylosa, and stylosa alba—winter flowering species; bicolor, and many others.

Flower Garden.

The continuance of manuring and digging flower borders, and the preparation of beds for special subjects, and pruning roses and other plants may be styled routine work for the present month. Beds for chrysanthemums and other plants cultivated for specially fine blooms should be prepared now, as far as adding stable manure and roughly digging to sweeten the soil. If the plants previously grown in the beds were infested with aphis or other insects, a dressing of gypsum (sulphate of lime) is advisable. It will destroy many insects and act as a manure also, and is a cheaper and better dressing than the slaked lime so commonly used.

Roses may be pruned during this and next month. Hybrid perpetuals should be pruned first; hybrid teas and teas later. The hybrid perpetuals are practically without leaves now, and may be cut hard back without detriment. Many of the tea roses are still in full leaf some even making new growths, and though they may be thinned it is not wise to behead them too early in winter.

A deal of improvement is noticeable in methods of pruning flowering plants generally, which is in a great measure due to the various horticultural societies in the State. Lectures are delivered, papers read, and practical demonstrations carried out by competent persons at meetings arranged by these societies, and information on important matters is spread over a greater range than would be likely from a few larger associations. Combined exhibitions may be wise and even necessary, but numerous, if small, societies and frequent meetings are undoubtedly of benefit to cultivators of all grades.

The most common fault in pruning roses is overcrowding of shoots, especially in the top of the plant. More thinning, *i.e.* entire removal of shoots, and less shortening back of those allowed to remain would be of benefit. The centre of the bushes should be fairly open, and old and weakly wood pruned away leaving a few strong well arranged shoots. In shortening the shoots that are reserved, the pruner must be guided by the vigor of the specimen dealt with, and in a measure with the characteristics of the variety. Weakly shoots must be cut back much harder than strong ones, and the plants will be better, much larger, and will produce finer blooms than if an excessive number of branches was saved. In the case of climbing varieties, old shoots should be cut right away, and the young shoots that have developed tied or trained in their stead and lightly topped. This treatment should not be applied to the Banksian, Fortune's Yellow, and other early blooming kinds, which should not be pruned until after flowering in spring. Newly planted roses should be pruned hard at time of planting.

Sweet peas may be sown for late blooming, and bulbs of early gladioli planted. Summer blooming liliums may also be planted, care being

taken that no organic manure comes into contact with the bulbs. Hardy annuals may be transplanted, and where such are growing thickly in patches where it is intended they shall bloom, they should be thinned and kept free from weeds.

Kitchen Garden.

Preparation of soil for future planting, and sowing seeds of various vegetables for spring use may be done. Planting out onions and asparagus from earlier sowings; preparation of manure for hot-bed where it is intended to raise tender plants early; and weeding and cleaning growing crops are seasonable operations in this department.

THE PROCLAIMED PLANTS OF VICTORIA.

(*Continued from page 336.*)

Alfred J. Ewart, D.Sc., Ph.D., F.L.S., Government Botanist; and J. R. Tovey, Herbarium Assistant.

Blackberry Bramble.

Rubus fruticosus, Linné. (*Rosaceæ.*)

The struggling stems arise from a perennial rootstock, without underground creeping shoots; the flowering stem, biennial, or of a few years duration, sometimes nearly erect, but more frequently arched, straggling or prostrate, often rooting, and forming fresh plants at the extremity, usually armed with prickles, either stout and hooked or thin and straight, with stiff hairs, or glandular bristles, or a short down, all variously intermingled or occasionally wanting. Stipules awl-shaped, or linear, inserted a short way up the leafstalk. Leaflets rather large, and coarse, either 3 or 5, the 2 or 4 lower ones inserted together at some distance below the terminal one, egg-shaped toothed, more or less downy, the midribs as well as the stalks usually armed with small hooked prickles. Flowers white or pink, in panicles at the ends of the branches. Fruit black, or very rarely dull red, not separating readily from the receptacle, the calyx usually turned down under it, or seldom closing over it.

An introduction from Europe and Asia. This hardy deciduous trailer has spread to a great extent, and is difficult to eradicate, especially when in hedges. In open ground it is easily kept under by cutting down to the base twice a year. Systematic eradication involves however the removal of the rootstock and the prevention of flowering and fruiting.

Proclaimed for various districts.

PLATE 14

WHEAT AND WHEAT-BREEDING.

H. Pye, Principal, Agricultural College, Dookie.

The advancement of science has had the effect of drawing special attention to the improvement of wheat and other cereals. Wheats are botanically named according to distinctive characteristics. Thus we have *Triticum vulgare* practically embracing all the wheats grown in Australia for commercial purposes; *T. turgidum* embracing such as Australian Poulard, Laidley, and Mummy or Miracle Wheat; *T. durum* (Desf) embracing such as Medeah, Belotourka, Kubanka and Velvet Don, principally grown for macaroni making, and now more extensively grown in some countries for blending purposes in the making of high class bread, biscuits, pastry, &c. *T. polonicum* or Polish wheat is a very distinctive one and is sometimes known as Mammoth Rye; it has very large glumes and long grains, and these are noticeable in many of the seedlings produced by crossing it on Medeah, whilst some of the seedlings resemble Medeah very much. *T. compactum* is the name applied to some clubbed or square headed varieties of which there are a good many. *T. spelta* (L) includes the Spelt or German wheats; *T. amyleum* or *dicoccum*, includes the Emmer wheats, and *T. monoccum* (L) is represented by the one-grained wheat. The last three sub-species are not generally grown for economic purposes, but are to be found only at Experimental Stations. Some authorities classify the sub-species stated above as really distinct species and not sub-species.

Emmer and Spelt wheats are not of any commercial value in this State, but for feed purposes for stock they would in many instances prove useful. They are difficult to thresh, the ears just breaking up, through being very brittle, whilst the chaff holds tightly to the grain. A few odd grains may thresh out but the flour from these grains is not much used, although it is useful for the purpose of blending with other flour to make special doughs. Emmer wheat with the chaff attached would possibly be useful for feeding stock in the dry parts of the State where oats would not succeed, and no doubt pigs would thrive well on it. It yields well but the bushel weighs only about 40 lbs. In using the above wheats for crossing purposes I have not had any particular success. The ears of the progeny seem brittle in most instances, and unsuited for general crop purposes; whilst of these crossbreds I have not procured a variety that is suitable for the harvester, and equal to or better than varieties already grown.

Wheat Breeding.

As a commercial product wheat stands among the most preeminent, and its production will continue to be a vital matter affecting the economic and social welfare of the people of the Commonwealth. It is not intended to enter deeply into the scientific aspect of wheat breeding, but it is intended to give an outline of this interesting work, a work which is more interesting now than, say fifteen years ago when the rural public had not begun to appreciate its general importance, and its bearing on a huge industry. Times have changed. The agriculturist is perhaps the one individual that the world at large needs most, and it is now doing its

best to make him fulfil his destiny for the betterment of all classes of men. A decade or more back and there were many farmers who smiled with incredulity at the efforts of the wheat-breeder. But after a few years the object of the work began to be understood. Then from hundreds, the number of farmers that annually visited the Dookie Agricultural College wheat plots, increased to over two thousand and they gradually began to learn that experiments in wheat breeding could be of some practical use to them. For instance, to put a girder around the straw of a variety and strengthen it, also to shorten the straw for the farmer on the wind swept plains who does not need length of straw, are two points that appeal to the practical grower, as also does the tightening of the chaff around the grain of some prolific variety that showers its wealth over the field with every puff of wind or summer breeze. The adding of an additional fertile floret to every spikelet, and increasing the number of spikelets; the implanting of higher feeding qualities to the grain, and

CROSS-FERTILIZING WHEATS AT THE DOOKIE AGRICULTURAL COLLEGE.

making the loaf a real staff of life to the poorest, also the effort to wrest from Nature her secrets so that all soils may be productive of this great staple article of food must convince not only the farmer but every citizen of the Commonwealth that scientific wheat-breeding should be encouraged. The greed for yield has dominated the growth for quality. To combine the two is the grand problem for the wheat breeder, but when so many other properties are to be implanted in the variety, the task of reaching near perfection is on a parallel with that of the breeder of stock who wishes to produce the perfect general-purpose cow, or the hen that lays abnormally large quantities of eggs and has toothsome flesh besides. Whether it is possible to raise varieties of wheat that will combine in them all the necessary virtues depends much on how high the standard of perfection is placed; still from past experience we can confidently say that a great future lies before the plant breeder, and that he will accomplish much that will encourage the belief that varieties will ultimately be produced suitable to the special economic conditions of each wheat-growing country.

Yield of Wheat.

Yield, naturally, is a prominent virtue, and it is the one more amenable to the will of the grower than perhaps any other. It is not to be inferred that the quality of prolificacy is not more inherent in one variety than in another, for such is not the case, yet one variety may be very prolific in one country and a failure in another, due to other forces acting detrimentally to its development. However, if a variety is suitable to the climate and soil, its yields are dominated by those physical conditions of the soil that are dependent on tillage operations, and it has been proved conclusively that with so hardy a plant as wheat, profitable crops may be grown on land that would scarcely produce any other marketable economic plant, simply by introducing a proper system of rotation in which the bare fallow plays an essential part.

Importance of Humus.

The humic and the moisture contents of ordinary soils are very strong factors governing their fertility, the excess in a few localities being detrimental. Over the great northern areas, and in fact southern areas also, the humic content of soils is far too small, and leaves them more sensible to every change of temperature and checks the action of the natural forces that unlock the plant food imprisoned in the soil. Practically the insufficiency of humus or decayed vegetable matter in the soil is seen in the cold appearance of the latter, in the manner it sets after rain, and in the regulating of the depth of ploughing, for deep ploughing cannot be entertained when the humic content of the soil is low, and what little there is, is confined to the first two or three inches at the surface. Thus the humic content of the soil is essential to lasting success, and stubbles, grass, rape, peas or any other form of humus-supplying agents should receive the deep attention of every farmer. There is too much speculating with the soil, and more so in regard to not supplying it with humus than perhaps anything else. Working the bare fallow at the proper times, and ploughing for it during the winter and early spring have conclusively demonstrated that the conservation of the natural rainfall in most instances supplies the all essential moisture for a satisfactory crop of wheat in every part of Victoria, if the land values be considered. These few words in reference to humus and moisture are stated in order to impress the student of the part he, as a farmer, must take in determining the prolificacy of his wheat crops, and that his management is really the essential to success.

Prolificacy may be inherent in the variety, but unless the conditions favorable to that quality are present, it is just as possible for the crop to give a fine yield, as it is for cows to yield a profitable return of butter or milk if the herd is kept in an enclosure with a straw stack, when, in the adjoining fields or in the silo and barn, there is an abundance of milk-producing food. Unless the wheat plant has the food in the soil available, and the essential physical conditions are present, it can no more prove its worth than could the cows in the dairy herd under the conditions mentioned. Hence it is not likely a variety of wheat will be produced that will meet the needs of speculative farming. Prolificacy may be a great factor in a wheat, such as Steinwedel, yet from the exceedingly great loss by shedding its grain the returns from a crop of it may be too frequently unsatisfactory. Undoubtedly then such a wheat would be quite unsuited for windy localities.

PHOSPHATIC FERTILIZERS.

It was determined at this College that the phosphatic fertilizers were the most essential for the soils of this district, and the results obtained by Mr. A. N. Pearson and Dr. Howell, Agricultural Chemists, over a wide area of Victoria conclusively bore out this experience, and since that time the yielding powers of the northern soils have been considerably enhanced by the general use of this fertilizer in conjunction with bare fallows, especially in the driest parts, and with rape and such fodders in conjunction with sheep in the more favoured parts. The experiments carried out fourteen years ago illustrated the effect of phosphatic fertilizers in inducing early ripening, which was more marked when experimenting with barley than with either wheat or oats.

The following are some rotations that fit most northern conditions where sheep are kept to feed down the rape:—Wheat, grass, fallow with or without rape; wheat, oats, grass, fallow with or without rape; or wheat, rape on stubbles, oats or barley, fallow. Under some conditions peas may enter into the rotation, and in course of time a higher system of management will be general. Where permanent pastures are desired top-dressing with fertilizers should be carried out.

THE PREPARATION AND CROSSING OF VARIETIES OF WHEAT.

The operation of crossing one wheat with another is a very simple one. The chief difficulties are:—fixing the type, and determining whether the variety has all the qualities that a good wheat should possess. The time for performing the operation is determined by watching the mother plant, and as soon as the stamens are showing in one or two plants, or the wheat is flowering, the time for work is at hand, for wheat is a self-fertilizing plant hence one variety may be grown next to another without crossing. The ear whose florets are intended to be fertilized is taken in hand before the anthers have burst, and just as they have the appearance of approaching maturity, which is known by the deeper yellow colour. Previous to this they are of a light yellow and brittle, but when ripe the least squeeze and the anthers burst, and spread the pollen over the feathery stigma, which of course would spoil the floret for crossing purposes, and a new one must then be selected. By means of a fine pair of pliers or forceps, the three stamens, with the anthers intact, are taken out, sometimes in the one operation. The best pliers for the purpose are those that open when pressed, and shut immediately the pressure is off.

The accessories useful in carrying out the work are a seat that can easily be arranged near the plants, a stand to hold the note book, and few articles such as cotton wool, gauze, paraffin paper, soft thread and scissors. Every care should be taken to keep the point of the forceps free from the wrong pollen grains, hence the point should be well wiped with a piece of soft cloth or it should be dipped in benzine or spirits of wine kept in a small bottle. The seat and stand may be simply small flat pieces of wood sufficiently strong fastened in the centre to a sound stick about 2 feet 6 inches long and pointed at the other end in order to drive it into the soil I use two old wickets that are iron shod; on these are fixed the flattened parts, about 6 inches by 8 inches, to act in the one case as a seat, and in the other as a table for the above articles. To one end of a piece of cord or tape the forceps are tied, the other end is fixed by a loop to a button or tied through a button hole to the vest, so that on releasing the forceps they are easily picked up again.

The ear selected is first examined in order to determine if it has not already been fertilized, or is too unripe. If ready the central florets of those to be fertilized are pulled out or cut off, which leaves more room for working at the outside florets. A little pressure on the ends of the pales, or what the farmers call chaff, and the floret opens. The three stamens may then be seen, and by the aid of the spring forceps the stamens are grasped and the slightest pull breaks them off with the anthers attached. If an anther bursts, of course this particular floret is spoiled and may be cut or broken off. A second floret is then operated on and so on until as many as are needed have been completed. The next operation is to prepare the ear from which the pollen to fertilize the stigmas of other florets is to be taken. This is simply done by cutting with a pair of scissors

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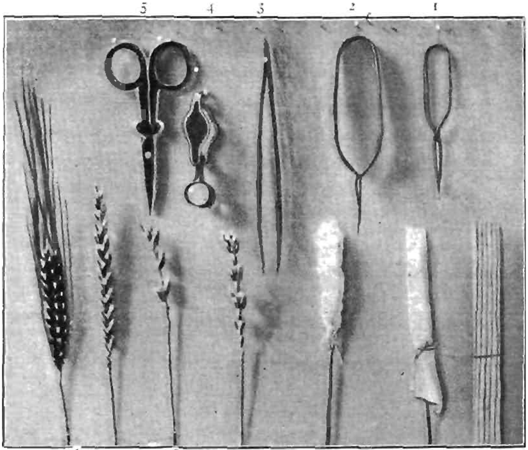

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SOME OF THE APPARATUS USED IN THE CROSS-FERTILIZING OF WHEAT.

1 and 2. Emasculating forceps. 3. Strong pair of forceps. 4. Pocket magnifying glass. 5. Scissors. 6. Ear of Medeah. 7. Ear of Bobs. 8 and 9. Bobs prepared for cross-fertilizing; (8 shows where floret has been broken off owing to self-fertilization during the process of cross-fertilizing). 10. Florets wrapped around by cotton wool to prevent insects, &c., carrying the pollen from other wheats. 11. Fertilized florets with cap of butter-paper and fixed to a support.

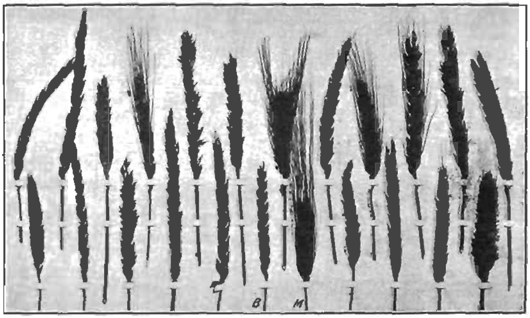
the tips of the florets, when, in a short time, if the pollen is ripe, the stamens appear. The anthers may be taken out similarly to the manner in which those of the florets to act as the mother parts were emasculated. The pollen cases open at the top, hence if placed downwards in the prepared floret, the slightest pressure against the sides of the pales causes

them to burst and dust the pollen grains over the feathery stigma; thus fertilization is effected. Some experimenters gather pollen and dust it over the stigmas, but this is more troublesome than dusting from the anther direct, especially if there is the least breeze. In regard to densely packed ears it follows naturally that some of the rows of spikelets have to be removed in order to give room, and to prevent self-fertilization should the pollen in the variety to be made the father be not sufficiently ripe at the time of emasculating what are to be the mother florets; for should there be any floret not emasculated the pollen from it would possibly find its way into those emasculated and spoil the work done. Personally I carry out the fertilizing as soon after emasculating as possible, though sometimes it has been necessary to wait several days for the pollen to ripen before fertilization could be effected. No florets but those worked on are allowed to remain, and I find that in order to check wind and insects from carrying pollen to the emasculated florets, a little strip of cotton wool wound around the operated ear is the best means of preventing fertilization. I cover the whole with a little gauze, or grease-proof paper if desirable. I found frequently that if a floret of oats or wheat were cut through half way down a grain would develop and in fact chance crosses were sometimes obtained. The cotton wool protects the emasculated florets well, allowing, owing to its elasticity, more room for expansion; it filters the air from pollen grains, and allows moisture transpired to pass off readily. A cap of waterproof paper of some kind is useful under some conditions, but here the climate is very favorable for the work.

The operation of crossing wheats is not a difficult one, and is well within the powers of women; in fact, with their delicacy of touch and patience they should find the breeding of new varieties of cereals and flowers an interesting occupation, and a new field of useful work would be open to the intelligent woman. At harvest time the grains should be carefully gathered, labelled, and at sowing time planted singly in rows 2 feet apart and 8 inches to a foot apart in the rows in order that every characteristic of each individual plant may be studied, such as nature of early growth, the tillering properties, flag, straw, ear and colouring. The plants of the first cross during the first season do not vary as a rule much from the mother, but the second generation shows a more or less wide variation of type according to the variations in the parents being many or few respectively. Thus Bobs or Medeah produced in one season from one ear of the second generation twenty-two different coloured or different shaped ears, six being bearded, the remainder being bald or with tip awns only. Of the six bearded seedlings one tended to become club-tipped and had the dark colouring of Medeah but not its solid straw, the second more nearly approached the Medeah type but was narrower and had straw not solid though more so than the first. Number three bearded had black awns like the others but the chaff on the whole was white except the extreme tips. Number four bearded had more the appearance of Bobs with chaff and awns cream coloured, whilst five had the dark awns. Number six was partly bearded, having the edges of the pales and glumes fringed with slate blue colour. The great difference between this ear and all the others was its tendency to branch like the Mummy wheat, though not to the same extent. The straw was fairly solid but not as much so as Medeah. Five of the bald selections were essentially of the Medeah type in colouring and six approached nearer Bobs in type but were splashed at the apex of the pales and glumes with the faintest dark markings; the remaining five had no markings and took after Bobs in type, but all were

more or less slightly tip-awned. The influence of Medeah was marked throughout, except that, as is mostly the case, the bald seedlings predominated, as they do as a rule whichever is selected as the mother, that is Bobs or Medeah—the former being perfectly bald and the other much bearded.

In some few instances I have lost varieties apparently by the want of pollination, only odd florets being fertile; and lastly, none fertile, though a well formed ear has been developed. Of the twenty-two seedlings obtained from Bobs crossed with Medeah, only one was solid-strawed, and that a bald seedling. In the reverse cross of Bobs on Medeah there were, out of 34 different seedlings, two with quite solid straw, one a bald seedling, the other a bearded one. Another bald seedling was much more solid than the remaining ones. This is the usual experience that I have so far noted, viz.:—the hollow straws predominate in a cross between hollow and solid-strawed varieties. The above applies to the crossbreds of the first variable generation in each case. There are other modifications during succeeding generations, and it is necessary to single out the types



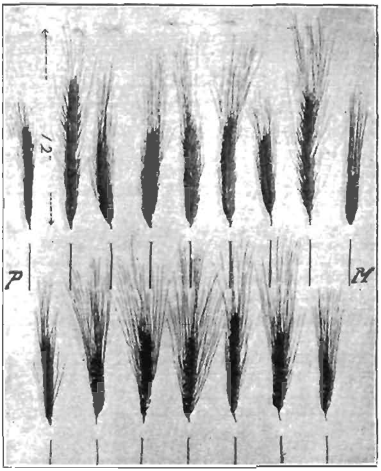
SEEDLINGS OBTAINED BY CROSSING BOBS BY MEDEAH.

B. Bobs. M. Medeah.

whose characteristics it is intended to fix. In some instances it is difficult to fix a variety, in others it is comparatively easy, much depending on the distinctions between the parents being many or few respectively, also whether in the individual seedling the elements of variability are such that there is what might be called a oneness of sympathy between the particular cells that give rise to a harmonious blending, for it sometimes happens that the type selected will not fix, but will die out; at least it is an experience I have had, and which other experiments may or may not confirm. Weak straws seem to predominate in varieties produced by crossing a weak-strawed prolific variety with a strong-strawed variety for the purpose of obtaining strong-strawed prolific varieties, but I have not carried out exhaustive tests in this direction, as a rule working only with early weak-strawed Indian varieties and with crosses from these. The sponginess of the straw of some thick coarse-strawed varieties is increased by rapidity of

growth, and these do not generally stand against the wind and weather. There are other properties that are inherent in some coarse-strawed varieties that enable them to stand, whilst the ability of the strongest-strawed varieties to stand, as every farmer knows, also depends on the cultivation, richness of the soil and the amount of moisture present.

It has been stated that the bald wheats have the preponderating influence when crossed on or by a bearded variety. In the instances noted, Medeah on Bobs, six out of twenty-two different seedlings were bearded, and in the case of the reverse cross there were eight bearded forms out of thirty-four. Medeah is a Durum with longish, hard, dark, somewhat horny grains, dark awns, chaff mostly dark-coloured, compact medium-sized ears, long solid straw. Bobs has a small tapering bald ear with light-coloured



PROGENY OBTAINED BY CROSSING MEDEAH WITH TRIFOLA.

Upper Row—Progeny of the Polish type. Outside ears are the mother (M) and father

Lower Row—Progeny of the Medeah type.

chaff, small somewhat translucent light-coloured grain of fair hardness, and slender straw of medium length and fairly good strength. If we examine the grain from each of the seedlings of the above when crossed it is noticeable that almost every one of them is longer than Bobs and more approaching in characteristic Medeah, but is generally softer. A few were larger than Medeah with a more starchy character than either parent. The progeny took more after the horny character of Medeah; however, had there been a better development, in a few instances there might have been others approaching more nearly the starchy type. The colouring of

Medeah was strongly marked in three seedlings, fairly strong in seven, slightly in four, and very slightly in eight, whilst twelve were not marked; that is, out of thirty-four different seedlings of the cross Bobs on Medeah twenty-two had traces of Medeah colouring. In the reverse cross, Medeah on Bobs, sixteen out of twenty-two seedlings were marked with Medeah colouring and six were not. Most of the seedlings, in fact almost all, had close or fairly close ears, but where an open-eared variety is used most of the seedlings tend to acquire the same characteristic. The prepotency of brown or red-chaffed varieties is stronger than the light-chaff varieties, and in the crossing of Tardent's Blue, a velvet chaff, on Tripola, a variety obtained by crossing Medeah on Polish wheat, the velvet chaff was in evidence in all the bald seedlings but not in the others; however in most other cases the velvet chaff predominated, if one of the parents was a velvet-chaff variety.

EARLY RIPENING.

The ripening of the seedlings varied within several days of each other. Most of them ripened later than Bobs and a few after Medeah. I do not think that either parent dominates to a great extent. There are more individual plants earlier than the later ripening parent than there are after it and there are fewer seedlings that ripen earlier than the early ripening parent than that ripen after it. Unfortunately the hot winds of November frequently spoil these experiments in early maturing by ripening the straw in less than a couple of hours.

RUST IN WHEAT.

One of the most rust-resistant varieties that I have grown is White Fife from Canada. It does not yield as well as the Purple Straw varieties, but it grows with a fine clean straw of good length. Most of the wheats suitable to the Northern areas are subject to rust, though some are more rust-resistant than others. Bobs was fairly rust-resistant here but in the coastal districts it does not appear to withstand the disease. Medeah is also fairly rust-resistant and possibly one or two of the progeny may be also. Whether it is possible to produce a variety that is absolutely rust-proof is a debatable question. It is possible to produce varieties practically rust-resistant for a district, but the same variety often becomes rusty when grown in another district where the conditions differ. The most rust-resistant varieties here are those with clean bright straw in which the texture appears close and not spongy. Possibly inherent in every plant there is a power of producing products that act as preservatives against disease and that when the conditions of climate are such that there is a diminution of the natural preservative the disease may begin to assert itself. At times, owing to the favorable conditions for the growth of rust, there is more chance for it making headway, and thus we find rust-resistant varieties more or less attacked by it. Whether the smooth hard-strawed varieties are less subject to the attacks of rust than the coarse spongy varieties I am not in as good a position to observe as those in places where rust troubles are prevalent. The spontaneity of its attacks would almost make one consider that it was inherent in the plant or resting in the humus of the soil waiting its chance to throw out the deadly spores.

CONCLUSION.

Noting from a fairly long experience here, that over a series of years, the small-grained varieties are as a rule not so prolific as the larger-grained

ones, principally because of climatic conditions, I have paid more attention to producing strong-floured varieties with larger grain. My principal reason for this is that when a small grain is shrivelled, even a little, its market value seems to be very much reduced compared with that of a shrivelled large-grained variety.

The climatic conditions of the wheat growing areas of Victoria are more favorable to the growth of the more starchy wheats, and the better the season the greater appears to be the percentage of starch compared with that of gluten. The Fife wheats such as Red Fife, White Fife, Stanley, Preston, and Percy are all small-grained, and include some of the best Canadian strong-flour wheats. I have grown them for a few years but cannot say that on any occasion they have proved profitable compared with Purple Straw and the wheats of a similar nature. There was always too great a loss in winnowing, and much more so in grading. This applies to small-grained varieties in general. Where the climate is more equable this trouble would not appear, except during rusty years, but until millers pay for wheat according to quality and amount of gluten, the farmer will grow the most prolific saleable varieties. Occasionally we hear of millers giving threepence per bushel more for a strong-flour variety, but it is not generally done, and in course of time when the special wheat is grown over a larger area, the price per bushel does not exceed that of a Purple Straw variety, which often is more prolific than the better quality wheat. No doubt the time will come when wheat will be sold in bulk lots on the test, and graded according to its bread-making properties as regards quality, and quantity of loaves made per sack of flour, or, in other words the strength of its flour.

I could scarcely close my notes without referring to the splendid work of the late Mr. William Farrer, of New South Wales. He died, as he wished, working to the last. He did an immense amount of patient and profitable work, and inspired a number of others to study the wheat problem in its many aspects. My first association with him dates back fifteen or sixteen years ago, since when I have had the pleasure of carrying out numerous experiments in conjunction with him, some of the latest being in connexion with the effort to produce bunt-resisting varieties of wheat. Mr. Farrer's great object was to produce a perfect wheat. I am endeavouring to achieve the same object, yet I find that without a testing-mill much of the work carried out at the College has to be confined to a narrower sphere than I desired, and fewer complete results are available.

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EXPERIMENTAL FARMS.

The Work at Wyuna.

A. S. Kenyon, C.E., Engineer for Agriculture.

In 1905, the Lands Purchase and Management Board purchased the Wyuna Estate from Messrs. Finlay Bros. Its area is, in round figures, 22,500 acres, and it includes almost every variety of soil typical of the Goulburn Valley. The best land, amounting to about one-half, is timbered

THE HOMESTEAD.

with box with occasional sandy ridges growing Murray pines. The plain land is of the usual character, a fine but shallow surface soil of a sandy nature, a sub-surface soil to about eighteen inches below the surface and a

stiff, cold, uninviting, red clay sub-soil from that depth downward. A similar description applies to the timber soil, although it is, on the whole, somewhat freer and less clayey. Analyses show about the average proportions of plant foods for our Northern areas, a striking feature being the apparent equality in this respect of the surface and sub-surface soils, though it is a well recognised fact that the ploughing in of the surface and bringing up of the sub-surface soil mean ruin to the producing quality of the land. Whether these stores of plant food in the sub-surface soil are capable of being made available is another matter and will not be dwelt upon here. The following are the typical analyses of the Wyuna soils and the average of the Northern areas.

WYUNA SOILS.

	Parts per 100,000.				
	Nitrogen.	Phosphoric Acid.	Potash.	Lime.	Chlorine.
Timbered Land.					
From surface to 6 inches depth ...	96	66	459	174	9
From 6 inches to 12 inches depth ...	71	67	918	166	14
From 12 inches to 18 inches depth ...	88	68	1,080	182	5
From 18 inches to 24 inches depth ..	55	81	1,060	290	14
Plain Land.					
From surface to 6 inches depth ..	71	52	261	134	4
From 6 inches to 12 inches depth .	95	58	614	218	10
From 12 inches to 18 inches depth .	64	52	609	190	9
From 18 inches to 24 inches depth ...	48	64	565	686	98
AVERAGE NORTHERN SOILS.					
Surface	100	60	450	1,000	7
Sub-soil	75	45	800	3,000	12

The Estate, with the exception of a few blocks let upon the share system for wheat growing, was devoted to wool raising and carried nearly one sheep to the acre. After its acquisition by the Board, the Estate was divided into 141 lots, 12 of about 20 acres for agricultural labourers, 24 of about 100 acres for orchards, and 105 for farms varying from 100 acres to 442 acres, averaging under 200 acres each.

With the exception of a portion near the River Goulburn, and subject, at times, to flooding, the whole estate is suitable for irrigated culture, the country being generally flat with a gentle north-westerly fall. It is situated within the area to be supplied with irrigation water by the Goulburn-Waranga national scheme of water supply.

It was at once seen, that with areas of land averaging from one-third to one-fourth of those of the surrounding farmers, different methods of farming would have to be followed, and the Government took steps to reticulate the estate with the most complete and systematic scheme of channelling yet adopted in Victoria with a view to providing irrigation supplies to each block and in volumes permitting of a considerable proportion of irrigated culture. The supply to this system of channels is to be drawn from the main eastern channel from the Waranga Basin; this channel is, unfortunately, not yet complete enough to afford a supply of

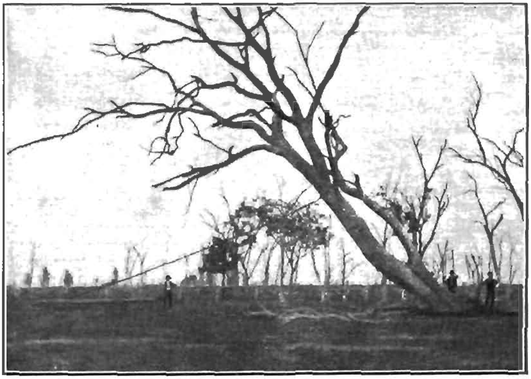
water. Meanwhile, a somewhat uncertain supply is being derived from the channels of the Rodney Irrigation District. Although irrigation had already proved successful in the Goulburn Valley, it was either in association with small areas under intense culture or with large areas relying upon it to a small extent only. Here at Wyuna with over 100 settlers on moderate sized farms who would have to depend principally upon irrigation for their returns a new problem presented itself, and the Minister of Water Supply, the Hon. Geo. Swinburne, M.L.A., decided upon a notable departure, viz., the establishment of a Government Farm where the feasibility and profitableness of working such small areas could be demonstrated.

In the initiation of any new method, in Agriculture as in any other pursuit, work must be at the outset largely experimental. Now it is not for the individual to undertake experimental work. It is not a fair burden for the individual; he is not as a rule fitted either by temperament or by training for such work; the cost of the failures, inevitable in any new departure, is considerable; and more important, the results are not available for the general public. The experimental farm is absolutely necessary to the prosperity of irrigated culture. Nor can the bogey of State Socialism be successfully raised, the cost and the benefits in such a case being shared by the whole community.

There is no country in the world where nature has bestowed her gifts of fertile soil and perfect climate with a more lavish hand than in Victoria. Yet these bounties are not to be obtained without hard work. To cause arable lands to unlock their stores of wealth, many questions have yet to be asked and answered. The proper rotation of crops, the selection of improved varieties of seeds, the times for sowing, the methods and thoroughness of tillage, the values and suitabilities of manures, the breeding of stock, the selection of dairy cows, the improvement of pastures, the perfecting of dairy and butter factory methods, are but a few of the problems besetting the farmer. After giving him all the praise for the strides he has made, not only as compared with past methods in this State but with present methods in other countries, it must be admitted that there is still much to learn. In the Northern areas and to some extent in the South, the full use of the land can only be made by means of irrigation. Experimental farms and plots conducted under Government supervision are urgently needed for the investigation of all agricultural problems. The experts attached to the Department of Agriculture have then a chance to demonstrate the practicability of their own ideas and proposals as well as to investigate suggestions of others. The Agricultural Colleges and Schools cannot efficiently carry out such work and at the same time successfully perform their own particular functions. In short the establishment of farms for enquiries under practical working conditions into new methods of agriculture are essential to maintain our present high position in production and to take the fullest advantage of great natural resources. It must, however, be remembered that as Rome was not built in a day neither can reliable results be obtained at once in experimental work. Whether in the field, in the cultivation paddock, or in the stalls, results must necessarily be subject to frequent revision and alteration; the factors of soils, seasons, and markets being so variable that long series of experiments giving average results are called for.

It is now time, however, to return to our immediate subject, the Government Farm at Wyuna. An area of 540 acres including the Homestead block and one adjoining on the west—allotments 3 and 6, section

A, Parish of Tongala—was reserved from applicants and transferred to the Minister of Agriculture by the Lands Purchase Board. The total value was set down at £3,790, a little over £7 per acre including improvements; these were valued at £1,000, giving an unimproved value of £5 3s. per acre. Operations on the farm are directed by the Engineer for Agriculture under the supervision of an Advisory Board consisting of Dr. Cherry, Director of Agriculture (Chairman), and Messrs. G. Pagan, irrigationist and farmer, Ardmona, and W. Orr, grazier and farmer, Shepparton. The direct management of the farm is in the hands of Mr. G. H. Tolley, formerly manager of the Mildura Irrigation Company, an experienced and practical horticulturist, and a well trained engineer and surveyor, who was for many years engaged in the actual laying out of many of our larger irrigation and water storage works. Besides managing the farm itself, his services are available for settlers in laying out their



CLEARING OPERATIONS.

Pulling down trees with the engine.

land for irrigation distribution and for general advice. It will be admitted that the representation of local interests and experience on the management by the appointment of two of the most successful farmers on the Goulburn is a step in the right direction and one that should be repeated in connexion with future establishments.

The objects of the farm are, as previously stated, mainly to show the profits to be made by working small areas under irrigation. It was at once recognised that the growing of foodstuffs for man, mainly fruit, had already been proved at Mildura, Rodney, and elsewhere to an extent that left little room for improvement. Besides, the problem was the working of small farms and the farmer is rarely a success as an orchardist, the two avocations not being, as a rule, easily worked in conjunction. There remained then the growing of fodder for consump

tion by stock. It was held by the Department and by the Advisory Board that for small areas the most profitable method of disposing of the fodder raised by tillage and irrigation would be its feeding to dairy cows, the product of which in cream, and the by-products in calves and pigs, would return the farmer his income. The main object, therefore, of the farm is the raising of the greatest amount of fodder which the land and water will permit, and its disposal, by means of the cow, as animal products, butter, meat, &c. Throughout all operations, however, the question is put at each turn, Will it pay? and any work, the profitableness of which is not beyond question is treated as an experiment, its cost charged to a separate account and the farm debited with the yields. It is hoped, therefore, to present farm operations and accounts in a practical form, so that the farmer may apply the lesson to his own case. Mr. Pagan, in an address to the Wyuna Progress Association on the possi-

CLEARING OPERATIONS.

The trees pulled down showing the butts dragged clear of the holes.

bilities of small irrigated blocks, gave such practical advice that it is worth reproducing. He said, "In his opinion, holdings of 100 acres of good land, with irrigation, were sufficient for a man and his family to make a living. That area was certainly ample to start on. He would advise that as a beginning 40 acres be put in with wheat and if the land had been fallowed previously or cultivated, to sow lucerne with it. If new land, then the settlers would have to wait another year for the lucerne. His idea was that lucerne was the best crop. It was the thing to make small areas pay. Then 10 acres should be devoted to other crops such as Cape barley, a most excellent winter fodder, a crop one could cut and cut again. On the land which had grown barley, a crop of maize or ambercane could be raised for the summer, making two crops off each one piece of ground. An acre or an acre and a half of mangolds should not be forgotten. It was a magnificent yielding crop and did

the ground good, but it required heavily manuring, particularly stable manure. Then 10 acres should be devoted to buildings and yards, bull paddock, calf paddock, and pig paddock. A small orchard and some vegetables should be grown, if only for home use. He had totted up results for the first year's operations, for the financial results were the main thing after all. Of course, he had estimated for everything going on well and smoothly. The wheat should return £100, 10 cows grazed on the 40 acres of grass left after cropping, etc., as advised, should bring in £100, pigs and calves he reckoned out at £50. That gave a total of £250 for the first year. He admitted it was pretty high, but believed it capable of attainment. Now for the second year. Wheat and lucerne sowing should proceed until all available land was under it. He advocated sowing wheat with the lucerne because it gave immediate returns. Well, for the second year he would put in another 40 acres of wheat and lucerne. The other crops might be the same as in the previous year, not forgetting the mangolds. Manuring must not be forgotten and stable manure should be particularly looked after, as it was much better than any chemical manures. The returns might be with favorable conditions—wheat £100, 15 cows, £150, calves £50, pigs £50 or £350 in all. The farm would then consist of 80 acres of lucerne divided into 10 paddocks with 20 acres devoted to barley, ambercane, mangolds, buildings and yards. The lucerne paddock should be ploughed up say, every eight years. The size of the paddock recommended was 10 acres, which would allow one paddock to be ploughed up each year. The ground would be too rank for wheat but was splendidly suited for oats or barley, which could be made into ensilage. In the third year he would increase the number of cows to 30 and would give up growing grain and go in simply for fodder—barley, oats, lucerne, ambercane, maize, mangolds—all food for cows and calves. The returns for the third year should come to—cows £300, calves £100, pigs £100, a gross amount of £500. People would think the amount set down for calves pretty stiff. There should be 30 calves and the general idea of value of poddies was 20 or 30 shillings. He had seen yearlings sold from £4 to £5 at 15 months old. He thought these figures could be reached by all, and that his estimate was reasonable. He would hand feed the calves, using hay or ensilage. They should not be kept too long. He was of opinion that calves were a good asset, and by breeding pigs he reckoned £100 could be got. He thought the total of £500 from the 100 acre holding was good enough.

As to irrigating there were two different systems, the first for lucerne and the second for mangolds and similar crops. For lucerne he advocated flooding the surface. The land should be marked out into certain widths, say two to three chains, with channels along the side. The strips should if possible follow the run of the country. The main channel should cut across and supply the smaller channel. With this system almost any kind of ground could be watered. On small holdings he would not have lands too wide. He thought two chains the most in those cases. He did not advocate grading, but would use the leveller for filling up crab holes, etc. For mangolds, furrow irrigation was necessary. In this, he used short lengths of say 1 in. pipe put through the bank. They governed the amount of water running into the furrow and one could go away easy in mind after setting all the furrows knowing that things would be all right on return. He used the Planet junr. cultivator or an orchard plough to make the furrows. There was great benefit in small outlets.

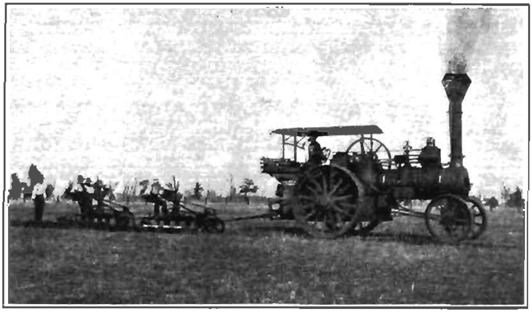
He sowed 8 lbs. lucerne seed to the acre in the autumn, towards the end of April being the best time. He sowed broadcast, using the drill with the tubes taken off. Mangolds should be planted in September, the best varieties being the Long Red and Yellow Globe. The seed should not be sown deep and it was better to steep it in water for 24 hours allowing it to dry enough to run freely through the drill before sowing. It would show up in a week but would require watering three times in a season or oftener on a small patch. Land for mangolds should be well cultivated, the disc harrows being the best for the purpose. The width between the drills should be 2 ft. 6 in. (or 2 ft. 8 in. sowed with the drill, the sowing to be as light as possible). As to the best autumn or winter grass for dairying, he favoured prairie grass, although the results would not be great. A better plan was to put in Cape barley. If sown in March, it would be ready in June, and it suited cows better than anything else. Lucerne hay made a good winter feed. For small holdings, he advocated feeding by hand. It took work, but it paid. He advocated a cross between Ayrshires and either Shorthorns or Herefords. Better calves were obtained from the fattening breeds. Lucerne should not be sown on the waterlogged parts of the plains, but on the red light land it was safe enough. Lucerne could be cut three or four times in a season. He had heard of six. It grew very quickly; three weeks after being eaten down and then watered, it was ready for another cutting. There was a risk in feeding cows on lucerne when it was too young. It should be in full bloom before the cattle were turned in, but for small holdings he urged cutting. Maize should be sown in October in drills 2 ft. 6 in. apart, as it had to be cultivated."

Settlement of the Wyuna Estate under the provisions of the Closer Settlement Act commenced on the 1st of March, 1906, and the work of the farm commenced forthwith, and is being developed simultaneously with that of the settlers. With few exceptions the original purchasers are still in possession of their holdings and have made great progress in reducing them to good farming condition and effecting permanent and substantial improvements and are enthusiastically and intelligently striving after success. The community as a whole will be one of contentment provided that there is an ample supply of water, a generous treatment in the matter of instalments of payments for the first few years and ample school facilities. No statistics of areas cultivated or permanent improvements made, have been collected, but upon their completion there will be room for general satisfaction. Owing to the lateness of the season when operations began and to the abnormal rains the areas sown were small and the results poor. This season the rains have been very light, causing considerable difficulty in breaking up and preparing the land; nevertheless a much larger area is under crop and showing good growth and a soaking rainfall now would leave little to be desired as regards the prospects of the coming season.

While the farm may have been admirably adapted for working from a sheep farming point of view, it required and still requires a great deal of remodelling to make it suitable for the purposes of an Experimental Farm. It was amply provided with buildings with the exception of those pertaining to dairying; this defect is being remedied as fast as convenient. A number of existing buildings and fences have been dismantled or removed and utilized in other places and a system of subdividing into small working paddocks commenced. As far as possible the fences are being made square to the farm boundaries. All the

buildings that are being retained have been renovated and painted; a 60-ton silo has been erected, a temporary cowshed adapted, and the framework of a modern cowshed to accommodate 22 cows is finished. Besides the fencing of paddocks for crops, a horse paddock of 12 acres, pig paddock of 4 acres, calf paddock of 4 acres, and bull paddock of 5 acres, are complete and so arranged as to admit of further subdivision as occasion arises. The old station orchard has been uprooted and an area of about 1 acre graded and planted with most varieties of the best fruit trees and vines, and half-an-acre devoted to vegetables, nursery, and experimental purposes. The ornamental side of gardening is represented by a series of small flower beds and lawns interspersed with a little rustic work.

At starting, the principal cultivated paddock of 150 acres was hand cleared of standing dead timber; the logs suitable were converted into fencing and building material. The residue was hauled by means of the traction engine and sledges to a depôt and stacked for future use,



CULTIVATING OPERATIONS.

Ploughing by steam. Eleven mould board furrows.

a saw bench for that purpose having been installed; a further area of 30 acres of similar standing timber was dealt with by the engine, the operation of pulling down and removing bodily from the holes lasting three days and involving a little more than the labour of three men, or a cost of £3 as against a contract rate for similar work of £18. The area fallowed comprised 140 acres of the cleared timber paddock, 88 acres of which were sown broadcast with a mixture of about 4 lbs. Dwarf Essex rape and ½ lb. mustard per acre, one half the area being manured with 56 lbs. superphosphate per acre and the remainder unmanured; the balance—52 acres—was bare fallow only but was several times worked with double disc harrows. Although the rape was sown so late as September, favorable rains resulted in a splendid growth especially on the manured portion. This was eaten down by a flock of 320 ewes and lambs which realized very satisfactory prices at the Melbourne sheep sales. Soon after they were gone another fair rain occurred resulting in

a splendid even growth over the whole paddock and it became one of the sights of the district. It was visited by numerous practical farmers and information has been continually sought as to methods pursued. The main object in sowing this crop was for the benefit of the root action on the soil for future operations, but it became necessary at Christmas time to secure 200 wethers to assist the cows to eat it down. The sheep when fat were sent to Melbourne and realized about their cost, the market being depressed.

During and after this period the bare fallow was thoroughly worked and graded and eventually sown to lucerne in various weights per acre, with and without manure and cover crops and broadcast and in drills of varying widths. The cover crops are wheat and oats and are sown both in the same and in alternate drills and the whole area is showing a very even growth. When the rape was nearly eaten off the engine was set to work to plough and, drawing 11 furrows, achieved highly satisfactory results at a very moderate cost. To show the condition of the ground a neighbour found it impossible to work a full day with 6 horses in a 2-furrow plough. The engine could have been loaded with another 4 furrows had such been available; as it was, the cost came out at less than half of that of horses. Had it not been for stumps the work may be said to have been perfect. This area is now sown to wheat, oats, barley, and prairie grass for grain and silage purposes and is showing a good even spring, but like the rest of the district sorely requires a good soaking subsoil rain.

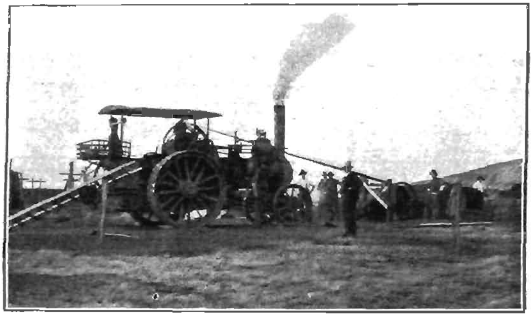
Forty-four acres of plain land were fallowed to rape and, though not giving so good a result as the timber land, yet yielded good pasturage. This has now been ploughed in and a crop of Federation wheat sown in various quantities both of grain and manure, the manures being superphosphate and Thomas' phosphate either alone or mixed. This paddock is also showing a good germination, and with favorable weather conditions should yield well. Thirty-two acres of old cultivation land were sown to Algerian oats and manured with 84 lbs. superphosphate. Circumstances caused the sowing to be late and the crop was very dirty. This when cut yielded 6 tons of hay and 54 tons of silage. The paddock has since been ploughed and worked and 5 acres sown to Dun peas (2 bushels per acre), 12 acres to a mixture of rape and peas, and the balance to rape only for grazing off. Fifteen acres of plain adjoining the homestead were sown to wheat under the same disadvantages as the previous paddock, and yielded about 5 tons of hay and 15 tons silage. Subsequently the land was worked and graded and a maize crop of 5 acres sown, but inability to get water for irrigation when required prevented this being a success and it was eaten off by the cows. The paddock was worked again and sown to 5 acres of Algerian oats and 15 acres Cape barley for silage purposes; the latter is showing very fair promise.

Eight acres of land were sown for experimental purposes in 2-acre lots with maize, sorghum, Kaffir corn and millet, but the yield was small owing to lack of water. With an acre plot of amber cane sown elsewhere 18 tons of silage were made. The plot has now been worked again and graded preparatory to sowing mangolds and tick beans. Four acres of the old pig paddock were sown experimentally with amber cane, cow peas, soy beans and mangolds. A fair amount of fodder resulted from the cow peas; the soy beans were attacked and destroyed by aphis, the amber cane was treated as above, the mangolds yielded a very heavy and profitable crop and are a grand fodder for cows and pigs. The

plot was the subject of much interest and enquiry and it is certain quite an impetus has been given to growing mangolds in the district. A small plot of land treated heavily with stable manure will yield surprising results and a quantity of the very best fodder when the dairy farmer most wants it. It is easy to grow and to harvest and requires abundance of water and cultivation. The farm pigs have had little else since the mangolds were fit to pick and are in good killing condition.

On 1 acre devoted to fruit trees and vines a few misses occurred, otherwise the tree growth is satisfactory. A careful selection of the best commercial fruit trees suitable to the locality was planted and it is hoped to demonstrate the capabilities of the district as a first rate fruit producer. The vegetable garden has been a great success and always carried a wealth of succulent growth of all the best varieties.

A patch of lucerne (1 acre) was sown, but lateness, grasshoppers, and want of water pretty well ruined it; it will be replanted. An experiment of sowing lucerne at various depths was tried in the garden. A plot of land was prepared and manured and 6 drills sown at depths



BRICKMAKING.
The engine running the plant.

of ½, 1, 1½, 2, 2½, and 3 inches respectively. It was then watered and received no further treatment afterwards. The first 5 rows came up simultaneously, the last 3 days later, and the most successful growth is in those rows planted 2 inches and 2½ inches deep. This must not be taken conclusively, as apart from the soil being richer than usual, the slugs and grasshoppers had their say.

Upon starting the farm a herd of 21 cows, mostly Ayrshire strain, was purchased, the services of Mr. S. S. Cameron, the Chief Veterinary Officer, being enlisted; at the beginning of the year 26 additional cows were obtained. Two shorthorn bulls were added, one of which has since been dispensed with. The pedigree of the present one is as follows:—Hayle, Duke of Pentland, calved 27.6.05, by imported milking shorthorn Hayle Duke (Champion Melbourne Show 1903 and 1905) out of Jessamine II. (Champion Melbourne Show, Milking Shorthorn, 1905; record 62 lbs.

milk per day for 9 weeks after calving). From this it will be seen that the Ayrshire-Shorthorn cross is aimed at. So far the progeny consists of 35 calves 12 of them being heifers. The whole herd is in first rate condition and only 1 cow has been lost. The average number milking has been 20 and the yield has averaged throughout slightly over 1½ galls. per cow daily. The daily yields are all tabulated and the milk from time to time tested with a Babcock tester, the use of which is available to settlers. Cream is also tested as a check against the Butter Factory which is local and co-operative, and no discrepancies have yet arisen. From the beginning of the year the milking cows have had a daily ration of 40 lbs. of silage which they eat with avidity. The silage has from time to time been varied with mangolds, cow peas, growing maize, and similar crops, and the pasture has been rape and natural grasses. It is the practice to rug all the milkers. It is the intention to largely increase the herd when the season's crops are gathered,

BRICKMAKING.

Operations at the wire cut machine. Turning out 9,000 bricks per day.

to establish milking machines and to erect an up-to-date dairy and provide motive power for its working. The results from 6 of the best cows are as follow:—

			Total lbs.				£	s.	d.
Amy—Milking	44 weeks	...	6,040 ...	Average per day,	19½ lbs.	Test, 3.8	10	9	0
Brindle ,,	40 ,,	...	6,580 ...	,, ,,	23½ ,,	,, 4.4	13	5	6
Nellie ,,	38 ,,	...	5,320 ...	,, ,,	20 ,,	,, 5.2	10	12	0
Rose ,,	37 ,,	...	5,310 ...	,, ,,	20½ ,,	,, 4.0	9	14	6
Snowy ,,	44 ,,	...	6,310 ...	,, ,,	20½ ,,	,, 4.4	12	14	6
Topsy ,,	37 ,,	...	5,700 ...	,, ,,	22 ,,	,, 4.1	11	8	6

The value of the butterfat has been set down at 11d., the average return received for the year.

A small herd of pigs is kept and has proved nearly all profit. New styes and yards have been designed; upon their completion and fodder

being available a pedigree boar will be purchased, and the raising of pigs undertaken seriously. Poultry raising is also to be undertaken in the forthcoming year, and yards and shelters are about to be erected. A feature of the farm will be the planting of shade and ornamental trees, and about 500 will be set out this season.

A wire cut brickmaking plant driven by the traction engine and capable of turning out 9,000 bricks per day has been installed. The bricks will be largely used for building and paving and will also be available to settlers at cost price. The first kiln will be ready for burning shortly. The actual cost is so low, the clay being excavated by plough and scoop and the fuel being obtained from clearing operations, that they will be used for all building operations. The cost will be about the same as weatherboard and considerably less than timber and iron.

A first-rate set of farming implements has been provided on the farm. These have been made available to settlers at a low charge and made much use of. Great satisfaction has been expressed with the tools used for grading and ditching and also with the double disc harrows, spike roller, and disc seed sower. The most important machine on the farm has proved to be the traction engine. The greater part of the ploughing and of the clearing, besides all cartage, has been done by it. It has also run the brickmaking plant, saw bench, chaff and silage cutters, centrifugal pump, and numerous smaller jobs. The fact that a team of four horses has been sufficient to do the rest of the work speaks volumes for the use made of the engine, which was bought with the principal object of giving a thorough test to an efficient system of subsoiling. Experiments in this direction will be made during the coming summer, as it is not considered advisable to subsoil while much moisture is present as there would be considerable risk of "puddling" and injury to the land.

Gradually the farm is being reticulated with a system of supply and distributory channels fitted with drops, stops, and sluices to effectively regulate the flow of irrigation water. In other places drains are to be cut to relieve swampy patches. A tank having a capacity of 7,000 cubic yards has been constructed to act as a standby for irrigating adjacent land should there be any failure in supply from the channels.

The silo erected is of 60-tons capacity, and has proved the standby of the farm. It was filled mostly with a crop of wild oats and finished off with about 10 tons of wheat all cut in a green state. After it had been used for a depth of 11 feet, 5 feet of maize, sorghum, amber cane, Kaffir corn and millet were siloed and immediately used for feeding. Upon first filling the silo, the contents were covered with about a foot of old straw and a cloth made from old bags. On that bags of earth weighing about 4 tons were added and remained for five weeks. The silo was then opened and feeding the cows began forthwith. The sample was excellent and remained so from start to finish; about 2 inches around the edges were somewhat discoloured but there was absolutely no waste. Very few of the cows wanted asking more than twice before becoming ravenous for silage, and the silo soon became their Mecca. A No. 2 chaffcutter was used for chaffing the silage with a cut of half-an-inch. An ordinary chain elevator was run with a belt from the machine and the whole driven by the traction engine. Once in order the plant ran very sweetly and it would have been quite possible to fill the silo in 3 days or perhaps less if strength had been available for carting the crops from the field. However, longer time was made the rule in order

that the silage might have effective trampling. Like the implements the chaffcutter and engine are available for settlers who may erect silos. The silo has created much interest and many farmers from far and near have inspected and expressed their intention to have a silo at the earliest possible moment.

In addition to the cropping operations mentioned, the programme for the ensuing season includes among other things the erection of an up-to-date dairy, with boiler and turbine separator, milking machines, and motive power, brick pigstyes and accessories, calf pens and shelters, cattle shelters, wire netted boundary fence and subdivision fences.

A combined corn-crusher and mangold cutter and a seed grader are also being installed.

The rainfall for the past twelve months has been as follows:—

Year	Month	Day	Rainfall	Total
1906.	July	13	.03	
	,,	16	.70	
	,,	17	.13	
	,,	22	.11	
	,,	23	.07	
	,,	28	.27	
	,,	30	.11	= 1.42
	Aug	1	.11	
	,,	2	.07	
	,,	10	.06	
	,,	18	.40	
	,,	23	.09	
	,,	25	.20	
	,,	27	.10	
	,,	28	.10	
	,,	31	.67	= 1.80
	Sep.	3	.43	
	,,	6	.05	
	,,	9	.86	
	,,	10	.48	
	,,	14	.23	
	,,	19	.20	
	,,	27	.79	
	,,	28	.45	= 3·49
1906.	Oct.	2	1.25	
	,,	3	.30	
	,,	4	.18	
	,,	5	.13	
	,,	7	.10	
	,,	9	.18	
	,,	12	.07	
	,,	24	.29	
	,,	30	.02	= 2.52
	Nov.	3	.03	
	,,	4	.12	
	,,	5	.02	
	,,	14	1.40	
	,,	19	.40	
	,,	20	.08	
	,,	22	.25	
	,,	28	.27	
	,,	29	.42	
	,,	30	.05	= 3.04
	Dec.	11	.03	
	,,	18	.59	
	,,	24	.03	
	,,	31	.03	= .68
1907.	Jan.	26		.11
1907.	Feb.	6	.18	
	,,	7	.53	= .71
	Mar.	5	.53	
	,,	12	.02	
	,,	13	.38	= .93
	Apr.	6	.43	
	,,	7	.61	
	,,	19	.06	
	,,	22	.02	
	,,	23	.05	
	,,	29	.10	= 1.27
	May	2	.12	
	,,	21	.05	
	,,	22	.75	
	,,	24	.02	= ·94
	June	2	.63	
	,,	9	.19	
	,,	10	.05	
	,,	15	.21	
	,,	16	.05	
	,,	17	.04	
	,,	18	.04	= 1.21
	Total		...	18.12

A Progress Association has been formed on the settlement, and meets regularly once a month in the farm barn, and the attendances are large and growing. Its objects are chiefly to promote co-operation, to assist in every movement likely to benefit the settlement, and to promote social intercourse. Organized bodies for the acquirement of accurate and up-to-date information on agricultural matters are as necessary to the farmer as the experimental farms, for in such associations the results obtained on the farms can be demonstrated and discussed. A pleasing feature of the Progress Association Meeting has been the lectures and demonstrations given by departmental officers, including Dr. Cherry (Director of Agriculture), Mr. S. S. Cameron (Chief Veterinary Officer), Mr. F. E. Lee (Agricultural Superintendent), Mr. R. T. Archer (Dairy Expert), Mr. H. V. Hawkins (Poultry Expert), and Mr. G. H. Tolley (Farm Manager.)

Much appreciation as well as some candid criticism has been expressed by the progressive farmers who have visited the farm. The visitors have in fact been so numerous that a considerable portion of

the manager's time has been taken up in showing them round and explaining methods. It must not be imagined, however, that visitors are unwelcome; the main object of the farm is to demonstrate certain things, and inspection will teach more, far more, than mere printed reports. Consequently visitors are always welcome.

It cannot be said that the past year's operations have yielded much from an irrigation point of view. Inability to obtain water at the right time precluded useful experiments. What has been done, however, is to show the settlers the value of rape and mangold crops, the use of silage and its advantages, the preparation of land for irrigation, and utility of a traction engine upon a farm with operations big enough to justify its employment. The manager has proved himself in this first year an indefatigable and practical worker, a keen enthusiast as to the results of irrigation, and has evinced much tact in arousing the interest of the settlers on the estate. To him much of the success which is confidently anticipated will be due.

THE ELEMENTS OF ANIMAL PHYSIOLOGY.

W. A. Osborne, M.B., D.Sc., Professor of Physiology and Histology, Dean of the Faculty of Agriculture in the University of Melbourne.

(Continued from page 346.)

CHAPTER VIII.

Animal Heat.

It has long been recognised that from the stand-point alone of temperature animals can be divided into two great groups. The popular terms for these groups namely *cold-blooded* and *warm-blooded* are based upon very profound differences, but they are not too well chosen, for a so-called cold-blooded animal, say, a snake, may occasionally have a temperature exceeding that of a so-called warm-blooded animal, say a man or a horse. The true distinguishing point is this that, in one class, the temperature of the animal is never far removed from the temperature of the environment, and that it varies within wide limits and parallel with the changes in temperature to which the animal is exposed. The temperature of such an animal is in fact determined by the temperature of the environment in which it lives. Such an animal we may call an animal of variable temperature or, to use the technical adjective, a poikilothermal animal. But when we examine a bird or a mammal we find that its temperature varies within extremely narrow limits, is independent of ordinary changes in environment and has a marked tendency to remain constant. Birds and mammals are therefore constant-temperature animals or homoiothermal. The homoiothermal animals by virtue of their constant temperature possess many advantages over the poikilothermal. It has already been stated that the activities of all cells increase or decrease as the temperature of the cells rises or falls. Thus it is that a lizard is active on a warm day but

sluggish on a cold one. The vitality of such a creature is constantly changing with the weather and the animal has but feeble powers of resisting extremes of temperature. A homoiothermal animal on the other hand can remain uniformly active despite extensive changes in climate or season and is not compelled on the onset of cold to abate one jot of its activity; on the contrary, for a reason we shall shortly see, it is actually stimulated by cold to more energetic movements.

The temperature of a mammal or bird is never absolutely constant; it shows distinct oscillations, but these oscillations are small and within fairly fixed degrees of temperature. The temperature of a man at 6 o'clock in the evening is generally about $1\frac{3}{4}$ degrees* F. higher than that taken shortly after midnight, but the average temperature remains remarkably constant. When we speak therefore of the normal temperature of a man or any other mammal we mean a temperature which lies well within the daily range of oscillation in health. Thus the normal temperature of a man is given as 98.4 F. in England, but as 98.9 F. in Germany; both are right for both are within the daily range of rise and fall.

Another difficulty in giving a fixed value to the temperature of a homoiothermal animal is the fact that all parts of the body of the same animal have not the same temperature. Stated generally the more central organs are warmer than those nearer the surface, the maximum being found in the blood flowing from the liver. As a rule the readings of a thermometer placed in the rectum may be accepted as giving a good idea of the internal temperature of an animal. The following values may be taken as approximately correct for the normal rectal temperatures of various domestic animals:—

horse	100 —102 F.	cat	101.7 F.
cow	101.5—102	fowl	107—109
sheep	104 —105	duck	108—110
pig	101 —103	goose	107
dog	100.2—100.9	turkey	109

It is interesting to note that the temperature of most homoiothermal animals is only a little below that temperature at which the enzymes act most rapidly; this is doubtless the chief reason why we find such a temperature in the highest evolved animals.

As man and most domestic animals belong to the homoiothermal group attention may be confined exclusively to this class and the methods by which a practically constant temperature is maintained, may be discussed under the headings, the source of heat, the distribution of heat, the loss of heat, and finally the physiological variations in an animal's temperature.

THE SOURCE OF HEAT.—In every living cell of the body heat is produced, but the amounts formed in the smaller organs, such as the salivary glands, may be very minute and scarcely detectable. It is to the skeletal muscles that we must look for the main source of animal heat. In an animal apparently quite at rest the breathing muscles are active and moveover the other skeletal muscles are mostly in a state of tautness or "tone" which implies chemical change and heat production. During violent exercise the heat produced may be so great that the animal cannot get rid of it quick enough and a passing rise in temperature may be noted. On the other hand if an animal is drugged with chloroform, ether, or alcohol, muscle tone is greatly diminished and the animal's temperature will fall unless the surrounding air be kept sufficiently warm. An animal

* Throughout this chapter temperature is measured in degrees Fahrenheit, as this system, *for some inexplicable reason,* is more popular in English-speaking countries

whose muscles are rendered inactive by the poison curare will, if kept alive by artificial respiration, gradually sink to within a few degrees of the temperature of the room and become to all intents and purposes a poikilothermal animal.

Next in importance to the muscles may be placed the liver where chemical transformations are continually occurring most or all of which liberate heat. As has been stated the blood leaving the liver is the hottest in the body. Next in importance to the liver, as heat producing tissues we may place the heart, and the smooth muscles particularly those in the digestive tract.

THE DISTRIBUTION OF HEAT.—The heat produced in any muscle or organ tends by ordinary physical conduction to spread to adjacent organs, but the chief factor in heat distribution is the blood-stream which is constantly perfusing each tissue and organ and passing thence to the heart.

THE LOSS OF HEAT.—The chief loss of heat is from the skin, concerning the structure of which a few words may be said. The skin or integument can be divided for descriptive purposes into two parts. The superficial part is epithelial and is composed of closely packed epithelial cells which are constantly being renewed and pushed up from below and as constantly being shed at the surface. This layer has neither blood vessels nor nerves. Special outgrowths of this layer form hair, feather, nails, claws and the bloodless parts of hoof and horn. The second or deeper part of the skin is formed of connective tissue, is rich in blood vessels and nerves and possesses special sensory nerve-endings. This layer contains two sorts of glands with ducts that pierce the epithelial layer and pour their secretion on the surface. The *sweat glands* secrete a fluid sweat, consisting chiefly of water and containing traces of salts, urea and fatty acids. The *sebaceous glands* secrete a semi-solid, oleaginous substance (sebum) which consists of lipoid and a little protein and water. The sebum acts as a natural ointment keeping the skin and hair soft, and preventing them from being injured by rain and moisture. Both these glands are constantly secreting, though their activity is subject to considerable variations in intensity. In the connective-tissue part of the skin, or below it, we find a layer of fat.

The skin has many functions to perform; it protects the muscles and other organs beneath it from mechanical injury and from rain, strong sunshine, &c.; it helps a little in getting rid of waste matter and excess of water. The skin possesses sensory nerve-endings which are responsive to heat and cold, to injury, and to contact with bodies or to movements of hairs. Only under abnormal and rare conditions can it absorb fluid from without. But one of the most important functions is its blanketing action in keeping the heat of the body from escaping too rapidly and by allowing changes to be made in the rate of heat escape. In the first place the layer of fat already mentioned is a very efficient non-conductor of heat. This layer is, in consequence, enormously developed in those animals which live in the ocean, and particularly in cold latitudes, as, for instance, porpoises, seals, whales, &c. It is also well developed in the pig. The epithelial portion is likewise a feeble conductor especially when it is thick, as it is in the elephant, &c. Then, as outgrowths from the skin, we find in the majority of homoiothermal animals, hair, fur, wool or feathers which act, not so much by their intrinsic feebly conducting powers, as from the fact that they contain large volumes of air enclosed in myriads of tiny spaces. Now air, thus divided, is a very poor conductor of heat and to air is due the chief value of these natural coverings, as well as that of

the artificial clothing of human beings.* When a bird ruffles its feathers in cold weather it merely adds to the enclosed air and this acts as an extra layer of clothing. The same action may be observed in many mammals.

Heat is lost from the skin in three ways. First by radiation, in the same way as a fire in an old-fashioned fireplace radiates its heat into the room. Secondly by conduction, that is by warming the air with which the surface of the body is in contact; thus a stove in the middle of a room not only radiates heat, but also conducts heat by warming the adjacent air. Loss of heat by conduction is great when the air is cold, greater when the air is cold and moist, and greater still when the air is cold, moist, and in rapid movement. The third method is by evaporation of water or sweat. Sweat glands are found in great number in man and the horse; very much less in sheep and swine; and still less in cattle, dogs and cats. In man and the horse the amount of sweat secreted is generally just enough to balance the loss by evaporation so that the sweat just comes to the surface of the sweat pores and no more. When the evaporation is checked by certain conditions of the atmosphere, or when excess of sweat is secreted, as in violent exertion, certain diseases and disorders and nervous disturbances, the sweat accumulates and trickles down the surface, particularly from those regions most abundantly supplied with sweat glands.

The cooling action of evaporation is familiar in the various devices for keeping drinking water and butter cool in warm weather as by porous clay or damp cloth. Evaporation is greater the drier the air and the quicker the air movement. If the air is saturated with water vapour then no evaporation can take place from a moist surface no matter what the velocity of the air is, or its temperature within the limits that occur naturally.

Heat is also lost in the lungs and respiratory passages by warming the air breathed in, or inspired, as also by the evaporation of water from the lining membrane of these tracts. This loss of heat from the lungs, etc., plays a more important part in the feebly-sweating animals (cattle, dogs, cats) than in the sweating (man and horse).

Some heat is also lost by the warming of food and drink which are generally cooler than the stomach which they enter.

THE REGULATION OF TEMPERATURE.—We have now to explain how it comes about that all mammals which are found both in tropical and polar regions are able to maintain a practically constant temperature which varies very little with species and variety. We shall find that homoiothermal animals in cold latitudes have an extra thick coating of fur or subcutaneous fat to retain the heat. Some such, as the bat, adopt the artifice of becoming poikilothermal during the winter and spending the cold months sleeping in a sheltered retreat. Then too we are familiar with the seasonal shedding of fur or feathers and the growth of a thicker coat for winter.

But the most interesting problem is the maintenance of a constant temperature from day to day in each animal despite great changes in heat production and the atmospheric conditions that influence heat loss. Most people are familiar with the principle of the common incubator for hatching eggs. Here there is a mechanical arrangement by which, when the temperature rises a little above what is described, the heat supply is automatically

* A given volume of flannel or woollen cloth contains a larger volume of air than the same volume of linen or cotton stuff, hence its high value as a clothing material.

reduced. An instrument on the same principle, but far more delicate, is the thermostat of the chemist which can be kept constant to within a one fiftieth of a degree Fahrenheit. Here too the flame yielding the heat is reduced when the temperature of the thermostat rises only a small fraction of a degree. But the incubator or thermostat must be kept in a sheltered room and cannot be exposed to rain and snow and frost; moreover the combustion in the flame cannot be allowed to fluctuate within wide limits. The superiority of the homoiothermal animal to such a mechanism lies in the fact that not only can it regulate its heat supply but also can regulate its heat loss.

How is the heat supply regulated? When a mammal or bird is exposed to atmospheric conditions that check heat loss and therefore tend to allow the heat of the body to accumulate we find that, through the agency of the nervous system, the muscle tone is reduced and that the animal instinctively avoids strenuous exertion. There is less combustion in the body as can be shown by the diminished consumption of food and the decreased output of carbon dioxide. Conversely when the animal is exposed to cold its muscle-tone is reflexly raised, it instinctively takes exercise, and its consumption of food and output of carbon dioxide may be more than doubled. That play of muscles which we call shivering is a muscular effort for the sole purpose of raising the temperature. A bat waking from its winter sleep resorts to shivering to work up its temperature rapidly and animals in fever show the same thing.

How is the heat loss regulated? An animal may be called upon to do strenuous work irrespective of weather conditions; moreover there is in the resting animal sufficient combustion going on to make the temperature mount up if the heat loss from the skin is seriously interfered with. We shall find in the homoiothermal animal that there are continual adjustments of the heat loss to suit the altered combustion within and the altered state of the air without. In the first place, if, through any reason, it is necessary to check heat loss the blood vessels in the lower layer of the skin contract, so that less blood flows through the skin and less heat is lost by radiation and conduction. We also find in most birds and mammals that the little muscles attached to the roots of the hairs or feathers, contract so that the external coat is ruffled and made therefore a poor conductor of heat. Man possesses these muscles, but their contraction in cold, producing goose-skin, is useless as he has lost in the process of evolution his hairy covering. Many animals reduce the surface of the exposed skin by cowering or huddling the limbs together.

If however the heat of the body threatens to accumulate then various devices can be brought into play to facilitate heat loss. The superficial vessels can be enlarged and the skin flooded with quick flowing blood so that radiation and conduction are increased. In man and the horse sweat can be poured out in great volume over the skin. Further, the breathing may be increased so that loss of heat from the lungs and air passages and even mouth may be increased; this reaction is more marked in the non-sweating animals, witness the lolling tongue and panting respiration of a dog after violent exertion or even when artifically heated.

The exact mechanism by which heat is regulated is not clearly understood. There is undoubtedly in the central nervous system and most probably in the medulla oblongata a nerve centre exquisitely sensitive to changes in temperature and from which nerve impulses can pass to the skin, blood vessels, muscles, etc.

THE VARIATIONS OF HEAT.—The capability of regulating the temperature within narrow limits varies with different species. In the non-sweating animals and particularly with those that have a thick woolly covering (sheep) or a thick layer of skin-fat (pig), exertion in warm weather may readily bring about an accumulation of heat in the body which is often dangerous. Man and the horse owing to their rich supply of sweat glands are far better off in this respect than cattle. The wonderful endurance of the horse is in large measure due to this provision; it can keep on trotting without any marked rise of temperature whereas a bull after a few rushes mounts up to fever-heat and shows distressed respiration. This same provision is also responsible for the fact that man and the horse can stand temperatures much higher than that of the body, provided the air be dry and in motion. Under these conditions a man can readily stand a temperature above the boiling point of water. If however the air be warm, moist and calm, thus giving little play to conduction and evaporation, violent exertion in all animals will bring about a rise in temperature which is often serious and occasionally fatal.

When an animal is exposed to cold so extreme that it cannot be combated by increased heat formation and decreased heat loss, the temperature of the body sinks, the animal falls into a deep sleep, and eventually dies. Recovery can occur by artificial warming if the temperature has not fallen below 50 degrees F. If a part of the body be frozen, gangrene generally results and the frozen part is lost. As to the highest internal temperature which the animal body can stand the limit usually given is 113 degrees F. The highest authentic case in man followed by recovery was 111 degrees F., which occurred in rheumatic fever.

The temperature of an animal varies slightly with age being higher in extreme youth and also, according to some observers, in extreme old age. Starvation tends to lower temperature, and the taking of food tends to elevate it. In all diseased conditions where there is true inflammation a rise of temperature is observed.

In conclusion a few points may be noticed some of which have a practical interest.

Cold is not well borne by animals that are thin or by animals that are small in size. In this latter case the surface of the body is much greater compared with the weight than it is in larger animals.

Clipping or shearing throws a great strain on the heat regulating mechanism particularly in moist, cold weather. Animals may actually show a higher temperature after clipping than before—this means a very great increase in the heat production.

Animals exposed to cold eat more food than if not so exposed, as part of the food is used in the body for heat formation.

Animals that sweat feebly, and particularly those with heavy coats or with much skin fat, are very liable to develop a high temperature; they invariably do so if over exerted.

Moisture in cold air aids conduction, moisture in warm air hinders evaporation.

Air that is moist and warm is specially harmful if impure through defective ventilation.

LAMENESS IN HORSES.

(*Continued from page 426.*)

S. S. Cameron, M.R.C.V.S., Chief Veterinary Officer.

LAMENESS IN THE LOINS.

Apart from the partial or total paralysis of "broken back," which will be described later on, and that of spinal congestion or "Kumree," a disease especially prevalent in India, lameness in the loins may result from either of the two following conditions:—

I. Sprain of the Lumbar Muscles, principally the *longissimus dorsi* muscle overlying the loin and constituting the "upper cut" in the sirloin of beef.

In these cases the animal may be able to walk or trot in a straight line but it has great difficulty in turning round. In attempting the turning movement the hind legs are thrown about in an awkward manner as if imperfectly controlled, the hind quarters reel from side to side and the animal may fall. There is also great difficulty in backing.

II. Sprain of the Psoæ or Sub-lumbar Muscles.—These muscles are situated on the underside of the loins and constitute the part known as the "under cut" in a sirloin of beef. When sprained the condition is often mistaken for broken back, but may be distinguished from it by the animal being able to move his hind limbs backward and forward when lying down.

SYMPTOMS.—In severe sprain of these muscles the following symptoms are shown:—When down the animal is unable to rise; but if raised by means of slings he may stand moderately well and may be able to control the movements of the limbs to some extent. When made to walk the horse drags his limbs, the feet being but slightly raised, and there is a tendency to knuckle over at the fetlocks and to drop the hind quarters at every step. If the hand be passed into the rectum, heat and swelling will be felt under the loins, which, in a few hours after the accident may extend to the fundament. In some cases only one side is affected.

CAUSES.—These sprains may be incurred:—(*a*) during an operation (*e.g.*, castration) when the horse is struggling on the ground with the hind limbs fixed. (*b*) During a supreme effort when pulling a heavy load, or when jumping a fence from a boggy "take-off." (*c*) When the hind limbs slip from under the horse backwards.

TREATMENT.—As in the treatment of all sprains rest is a prime necessity. In severe cases the horse should be encouraged to lie down and prevented from rising. A cooling laxative drench should be given and, if there is excessive local heat on internal examination, warm water enemas should be injected three or four times a day. In less severe cases when the horse can stand fairly well, slings may be put under him so that by their support he may get an occasional rest at will, but if he hangs in them continuously it is better that he should be allowed to go down. In all cases only soft and laxative food should be given. After some weeks when the acuteness of the sprain has been got over a blister, or "charge" of Stockholm tar, may be applied over the loins and a lengthened spell at grass allowed.

HIP LAMENESS.

As with shoulder lameness being popularly considered to be a common condition of lameness "in front," so likewise lameness "behind" is often

erroneously and vaguely put down to hip lameness. In point of fact it is a form of lameness comparatively rarely met with.

For present purposes "the hip" may be regarded as including all that portion of the anatomy from the loins to half way down the thigh bone, midway between the hip joint and the stifle joint; and having for its most prominent features (*a*) the "point of the hip" (the anterior spine of the ilium bone of the pelvis) showing out very prominently in "ragged hipped" horses, (*b*) the "point of the croup" comprising, in the middle line, the sacrum bone and on each side of it the posterior spines of the ilium, the lot forming an eminence immediately behind the loins in the middle line over which the crupper strap passes—sometimes called the "bump behind the saddle," (*c*), the "rump bone" or "point of the buttock" (the tuberosity of the ischium bone of the pelvis) which stands out on each side of the tail and is the most posterior prominence of the region, and (*d*) the "round bone" (the true hip joint) so called because of the shape of one of the bones (the head of the femur or drumstick) entering into the formation of the hip joint, which is situated a little to the rear of midway between the point of the hip in front and the point of the buttock behind.

Lameness in the region usually has its seat in either the muscles, the joint, or the bones of the part and a convenient classification will be:—

I. HIP SPRAIN, *i.e.*, SPRAIN OF THE MUSCLES OF THE HIP AND CROUP (the gluteal muscles).

II. DISEASE OR INJURY OF THE HIP JOINT.

III. FRACTURE OF THE PELVIC BONES.

Hip Sprain.

Sprain of the Gluteal Muscles or of their tendons of attachment occasionally occurs when a horse's feet slip from under him in a forward direction. There is generally swelling externally above the hip joint which may be detected by comparison with the opposite quarter. Tenderness may be exhibited on pressure. The horse will not lie down and when standing the limb is held loosely and pendulous with the joints flexed so that the sprained muscles may be slackened and the pain of stretching them avoided. During progression the horse steps short with the lame limb and there is a want of movement of the whole quarter which is carried forward with a kind of swinging or hopping action.

TREATMENT.—Perfect rest and hot fomentations applied three or four times a day are requisite in the early stages. A stimulating liniment should be rubbed in after fomenting, and the quarters clothed so that a "chill" may be avoided. When the acute pain has subsided a strong fly blister (see page 75) should be applied and a full cure encouraged by a lengthened spell in the paddock.

Hip-joint Injury or Disease.

The hip joint is a favorite seat for the localization of rheumatism. In such cases the bone surfaces entering into the formation of the joint become roughened or, it may be, ulcerated, and bony growths may be thrown out from their edges whereby the free movement of the joint is restricted. The injuries that may be sustained by the joint include chipping of the edges of the articular surfaces of the joint bones and rupture of the binding ligaments of the joint. The latter condition occasionally occurs to horses on shipboard when the hind limbs slip wide

apart, the ligament usually injured or torn being the *pubio-femoral*. When this happens the seat of the injury is obvious, for the horse cannot draw the limb to his side. An animal to which such an accident has happened is described as being "spaldered."

TREATMENT.—For the rheumatic condition general treatment with anti-rheumatic medicines must be followed and a blister may be applied. Beyond rest, little can be done for joint injuries. Counter-irritants in the form of blisters or strong liniments may be useful and in some cases point firing has been resorted to with good effect. For the "spaldered" condition slinging may be necessary if, as is justifiable in the case of valuable breeding stock, treatment is decided on, and the limb may be kept in position by strapping it to its fellow.

Fracture of the Pelvic Bones.

The character of the lameness will vary slightly according to the particular part of the pelvis that is fractured. In most cases however, while the horse may be able to bear weight well on limb when at rest, during movement a difficulty in advancing it is evident.

The different kinds of fracture of the pelvis and their causes and treatment will be dealt with in the Chapter on Fractures.

STIFLE LAMENESS.

Apart from dislocation of the *patella* or stifle-cap, lameness in the region of the stifle usually results from an injury to some part of the stifle joint in which the articular surfaces become inflamed (arthritis) or from a wrench of the joint causing sprain of some of its ligaments.

The SYMPTOMS are pretty much the same in either case and are these:—

(*a*) Avoidance of motion in the joint;

(*b*) the limb is carried in a stiff extended manner sometimes in advance of its fellow and the toe is dragged on the ground;

(*c*) stepping short and bringing the foot forward with a swinging outward movement;

(*d*) an inclination to "knuckle over" at the fetlock;

(*e*) pain on manipulation, and perhaps swelling and other local signs. Lameness in the stifle never disappears or lessens with exercise but in hock lameness this frequently happens.

TREATMENT.—In the acute stages of the lameness hot fomentations should be applied and rest enjoined. Later on blistering the part at intervals of three weeks or a month will be most likely to promote recovery.

It should be mentioned that lameness in the stifle is not by any means so common as is usually supposed. The part is often wrongly credited with being the seat of lameness of obscure character and blister patches in the region are seen so often as to raise a smile on the part of those who know how infrequently blistering is necessary.

Dislocation of the Patella or Stifle-cap.

The *patella* or stifle-cap corresponds to the knee-cap of man and, like it, is liable to dislocation or partial dislocation (luxation) by accident. The condition is a rare one and occurs principally in foals or young immature horses when galloping or curvetting on hilly side-bank ground. It may also occur however in horses of any age through a bump of the

stifle against a door-post or other solid object, as when passing through a stable door or colliding with trees on timbered pasture.

On account of the shape of the lower end of the thigh bone (*femur*) over which the patella plays it is almost impossible for the dislocation to occur in an inward direction. The bone is displaced outwards and may be seen and felt as a prominence behind and to the side of its usual

Fig. 72. Reprint of Mayhew's illustration of the attitude in dislocation of patella.

position. Comparison with the normal stifle of the other limb or of another horse will make the displacement more obvious.

SYMPTOMS.—My observation of the position of the limb when at rest and the action during progression when this condition exists is somewhat at variance with the usual written description in text-books and at all events at variance with the impression given by any drawings I have seen. It is stated for instance that "the affected limb is kept pointed to the rear, straight and stiff" (*Hayes*) or "the limb becomes stretched backwards" (*Williams*), and this imaginary position of the limb is depicted in Mayhew's illustration, of which Fig. 72 is a copy given for the purpose of comparison with Figs. 73 and 74, which are reproduced from instantaneous photographs of a case which I had some years ago. Fig. 73 repre-

Fig. 73. Dislocation of patella—position at rest.

Fig. 74. Dislocation of patella—position during progression.

sents the position of the limb when at rest. The fetlock is bent completely over and the foot rests pendulous on the front of the wall on the ground, the anterior border of the limb from the point of the hip to the hock being almost in a straight line. The whole limb is apparently lengthened, the fetlock and hock being lower than their fellows. Fig. 74 represents the action during progression. The foot is swung from the hip outwards, and is dragged forward until it leaves the ground, when it is jerked up towards the fore leg. It appears rigid and straight, the hock and stifle taking little part in the action. The photograph was taken just at that moment when the limb was advanced furthest forward.

TREATMENT.—The displaced bone must be forcibly pushed back into its place but this can only be done when the limb is fully extended, *i.e.*, stretched forward. To enable this to be done a rope should be looped round the pastern and taken forward and attached collar-wise around the neck so that the limb may be retained in the position shown in Fig. 74. until the bone is pushed or jerked into its place with the hand. The rope may then be slightly relaxed until the toe just touches the ground with the limb well forward, and this position should be maintained practically continuously for a few days. If a blister be applied to the stifle the resultant swelling will act as a bandage and retard movement. When the limb is released the foot should be shod with a long-toed shoe and a rest prescribed. It may be advisable to put on a long-toed shoe before attempting to reduce the dislocation. In cases where the displacement is so great as to have caused rupture of the internal lateral ligament of the patella, complete recovery never occurs; the lameness is permanent and, except in the case of mares and stallions which may be used for breeding purposes, the patient may as well be shot.

LAMENESS IN THE GASKIN.

Lameness in this region is uncommon. It may occur when the leg bone (*tibia*) is fractured without displacement of the fractured bones taking place.

Williams refers to cases of rupture of the muscle in front of the tibia (the *flexor metatarsi*), the symptoms of which are quite characteristic, viz.:—a straightening of the hock and pulling back and lifting up of the whole limb, on account of the uncontrolled action of the posterior muscles of the leg.

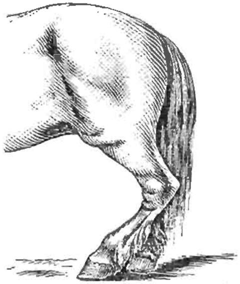


Fig. 75. Rupture of Gastroc-nemeii. Shows the position of the limb when the animal was standing. When moved the hock descended three or four inches (as far as the stretching of the skin would allow) below and behind the position as shown in the sketch.

The author has elsewhere recorded[1] an unusual case of lameness in the region resulting from laceration of those large muscles behind the tibia (the *gastroc-nemcii*) corresponding to the muscles of the calf in man. In this case the action was similar to that of a hamstrung horse, in that,

[1] *The Australasian Veterinary and Live Stock Journal July* 1890 and *The London Veterinary Record* 1890.

when standing, very little weight was thrown on the limb and the hock was flexed and "let down" three or four inches behind and below its fellow. (see Fig. 75). When made to walk, at each step when attempting to spring off that leg, the hock descended almost to the ground and it was evident that the structures which support it were torn, and that the extensor muscles of the hock were powerless and evidently relaxed. There was a fullness about the lower part of the quarter and symptoms of general

Fig. 76. Rupture of Gastroc-nemeii. Preserved dissected limb showing the torn muscles and the stripping of the periosteum from the front of the femur.

distress were pronounced. The cause of the rupture was evidently either a sudden slip forward of the limb with the hock partly bent, causing an excessive strain on the *gastroc-nemeii* muscles (a very general occurrence on the slippery wooden block pavement in the streets of Melbourne), or a very severe effort of these muscles to extend, that is straighten, the hock in an attempt to "lift" a heavy load—such an effort as more commonly results in the springing of a "curb" or a sprain of the back tendons. Figure 76 is a sketch of a dissection of the part of the limb involved showing the torn muscles.

HOCK LAMENESS.

The most frequent seat of lameness in the hind limb is the region of the hock. It is not only that there is a number of affections of the hock which cause lameness, but also that these are each of common occurrence, and that they all constitute definite unsoundnesses. The principal lamenesses of the hock are caused by thoroughpin, bog spavin, bone spavin, and curb.

Thoroughpin.

This is an elastic swelling, simulating that of windgall, occurring at the upper part of the hock at the back on each side of the tendinous band known as the hamstring (the *tendo-achilles*). The swelling is a distension with lubricating fluid (synovia) of a bursa through which the tendons pass. This bursa extends from the inner to the outer aspect of the tendons, and the swelling can be pushed from one side to the other by pressure of the hand—hence the name "thoroughpin" or "throughpin." (See Fig. 77.)

Fig. 77. Thoroughpin—the arrow points to the enlargement which in this case is slight.

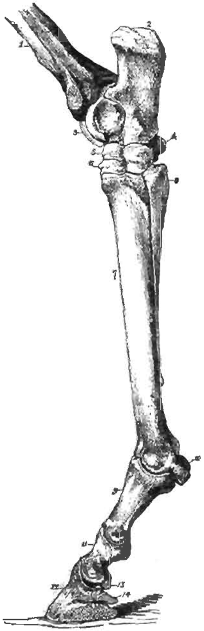
CAUSES.—The condition is usually associated with straight hocks, and is more common in draught than in light horses. It is frequently due to sprain of the tendons or of their sheath at this part. Young draught horses with straight hocks, when first put to work, often develop this annoying unsoundness.

SYMPTOMS.—The lameness is not usually very pronounced, but there is a stiffness of action of the hock which is likely to wear off with exercise, the cause of which is apparent in the movable swelling.

TREATMENT.—The application of pressure on both sides when the horse is at rest by means of pads adjusted with straps often results in temporary reduction of the swelling. Daily hand-rubbing is also beneficial. As a blister, to be repeated at weekly intervals for a time, the red mercury ointment (see page 75) or a ten per cent. mixture of oleate of mercury and sweet oil may be used.

Bog Spavin.

Bog spavin is a distension of the capsule of the true hock joint with synovia (joint oil). The condition exists most frequently in those horses which have either very straight or very crooked hocks, and it is fairly



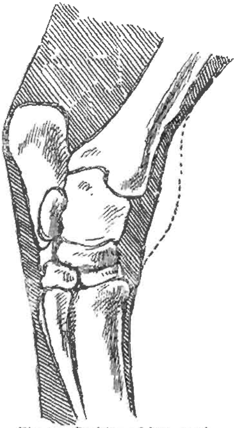


Fig. 79. Position of bog spavin indicated by dotted line. (After Hayes.)

Fig. 78. External view of bones of near hind limb. 1, Tibia; 2, calcaneum; 3, astragalus; 4, cuboid; 5, cuneiforme magnum; 6, cuneiforme medium; 7, great metatarsal (cannon); 8, external small metatarsal (splint); 9, os suffraginis (long pastern bone); 10, sesamoids; 11, os corona (short pastern bone); 12, os pedis (coffin bone); 13, os naviculare (navicular bone); 14, wing of os pedis. (After Strangways.)

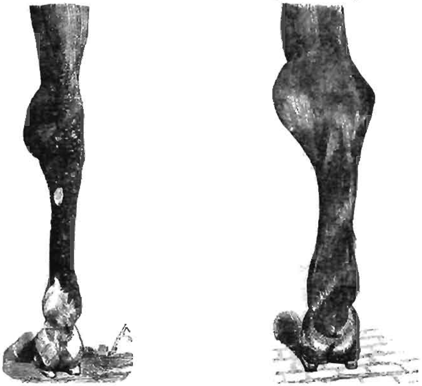
common in young cart horses when first put to work. The distension is evidenced in the form of a soft elastic swelling, resembling that of thoroughpin or windgall, standing out prominently on the inner aspect of the hock towards the front. (See Figs. 81, 82, and 83.) Like thoroughpin,

when this swelling is pressed upon it may be reduced, and a smaller distension appears on the outer aspect of the hock towards the back (Fig.

Fig. 80. Clean hock. (After Hayes.)

Fig. 81. Bog spavin (slightly). (After Hayes.)

84). The increased quantity of oil which causes the swelling is the result of friction beween the articular cartilages covering the ends of the



Figs. 82 and 83. Bog spavin (pronounced) seen from behind. (After Dollar.)

bones entering into the formation of the joint, the excess of joint oil being secreted to prevent or lesson that friction.

When the friction is very great it may give rise to actual inflammation of the joint, in which case the lameness is intense; the chief symptom being a stiffness or lack of bending of the hock during progression. In most cases however the lameness is not very marked, and oftentimes there may be a permanent distension of considerable size without any lameness being shown. In the latter case it is sometimes held that the disease should not be regarded as an unsoundness, but where the swelling is distinct and apparently permanent or where the slightest stiffness or lameness accompanies the swelling, there can be no doubt on the point. Bog spavin, thoroughpin, and windgalls are often associated in the same animal, and the tendency to the development of these synovial distensions is undoubtedly transmitted hereditarily.

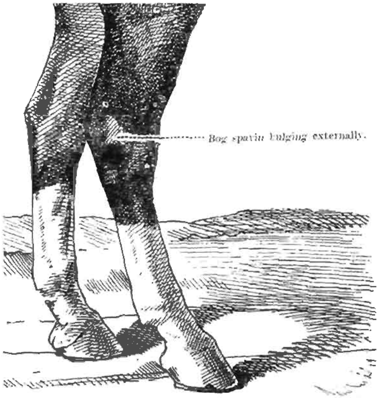


Fig. 84. Distension on outer aspect of hock from bog spavin when pressure is applied from inside.

TREATMENT.—When well established it is not practicable to permanently remove a bog spavin. In the early stages, and when lameness exists, most benefit results from the giving of complete rest. To insure this a blister may be applied, but the permanent value of blistering is very questionable.

Direct pressure from a padded bandage would be advantageous if it could be continuously applied, but it is next to impossible to apply a bandage to the hock in such a manner that it will be retained in position for any appreciable length of time. Temporary reduction of the swelling may be effected by drawing off the fluid by means of an aspirator, but as it is likely to collect again in a short time the treatment is not often followed. Besides, unless the operation is very skilfully performed under completely a-septic conditions there is very grave risk of an open-joint resulting.

(To be continued.)

FIFTH CONVENTION OF THE VICTORIAN CHAMBER OF AGRICULTURE, JUNE, 1907.

I. PRESENT DAY PROBLEMS OF AGRICULTURE.

T. Cherry, M.D., M.S., Director of Agriculture.

The Department of Agriculture of Victoria enters perhaps more fully into the every day activities of the farmer than that of any of the other Australian States. We attempt not only to control many of the conditions of the farm by means of inspectors, but we take the responsibility of advising farmers what to do from season to season, and try to get our very definite ideas about successful farm management put into practice. In a word, I hold that what is most necessary at the present day is not the discovery of new scientific facts, but a general levelling up of farm practice so as to bring the average up to what we know is capable of being accomplished by a man of average industry and common sense. Hence I am very glad of this opportunity of placing some of the ideas which guide the policy of the Department before your convention.

Now, there can be no question about the general prosperity of the Victorian farmer. The value of farm land can be best judged by the numbers of live stock that it carries. In two years there has been an all-round increase of 17 per cent. in the numbers of live stock carried in Victoria. At this rate the number will be doubled in less than nine years. At the same time the average returns from each head of cattle and sheep are steadily improving. Any business which is in such a position is undoubtedly healthy and prosperous. What we aim at doing is to hurry up the process and to place it on the soundest possible basis. We hold that the three great factors in increasing the fertility of Victorian lands are live stock, cultivation, and phosphoric acid. We are on surer ground in being dogmatic in this respect than ever before. Indeed, the matter is now removed from the region of doubt and speculation to one of certainty.

THE SECRETS OF PROGRESS.

There are three points on which we are able now to make definite statements which clearly explain the reasons for some of the oldest and best-established lines of farm practice. First, it has been known for ages that the crop which follows one of the pod-bearing plants is on the average more than usually prolific. In some way the pod-bearing or leguminous crop has left something behind it which has increased the fertility of the soil. Nowadays we can say definitely that the pod-bearers have the power of taking hold of the nitrogen of the atmosphere, changing it into something equivalent to nitric acid, and leaving this with the stubble in the soil to serve as food for the next series of plants that grow on the same soil. Hence the importance of peas, beans, lucerne, clover and trefoil. Further, such crops not only enrich the soil, but they supply the most valuable food for live stock that can be raised on the farm. Second, as to phosphoric acid. The experiments of the Department continued from year to year go to show that phosphoric acid is the one dominant requirement of Victorian soils, and that for northern land the best results with wheat were obtained by using 56 lbs. of 20 per cent. super. to the acre. Then again we can make a broad generalization which with a few trifling

local exceptions admits of no doubt or dispute. Such a definite statement is very different from what could only have been put forward cautiously as the best working hypothesis half-a-dozen years ago. Third, the value of animal manure—either obtained by grazing or as ordinary farm yard manure—may now be explained in a way that was not possible a few years ago. The surface soil is regarded no longer as being dead, but alive. Millions of invisible microscopic plants are in every particle of it, and are at work preparing food for next season's crop. Animal manure is the great means of replenishing this legion of effective workers, and the turning over of the surface soil by cultivation reinvigorates their growth. Hence you see the different effects of keeping sheep and cattle (so as to pass much of each year's crop through the animals) as compared with trusting to wheat growing alone with the usual annual burn off. These, gentlemen, are fundamental problems, and our belief and confidence in them will decide the general direction of farm practice. Phosphoric acid enables us to start poor land on the up grade. Cultivation vastly increases the amount of fodder that can be won from any given area of land. Live stock transforms the produce into the most valuable form of soil fertility. They complete the circle and enable us to explain why it is possible not only to win a good living from the soil from year to year, but also to leave the farm after a lifetime's work vastly richer than when we began.

THE NEED OF EDUCATIONAL EFFORTS.

To place the rising generation of farmers in a position which will enable them to have clear ideas on these points needs a development of our educational methods. Every country lad should grow up with an assured confidence in the success of country life. We require improved conditions in the school, on the farm, and in the home. One of these conditions will to some extent at least be met by introducing lessons in agriculture in the State schools, by extending the farmers' classes, and by establishing agricultural high schools. During the past year marked progress has been made in all these directions. The high schools opened at Sale and Warrnambool have already won a large amount of support from the surrounding districts, and extension of the buildings is already mooted in the case of Sale. Four others will probably be opened before the close of the year. In some quarters the Department is criticised for not establishing experimental stations. As a matter of fact we have farms at Rutherglen, Whitfield, Wyuna and Ballarat, all of which will develop into centres for original work in every branch of agriculture.

PROGRESS IN RURAL PRODUCTION.

Oversea exports of farm products from Victoria have risen from £10,725,000 in 1904 to £12,370,000 in 1906. When it is remembered that the former year was far and away the most favorable as far as season and rainfall are concerned of any we have ever experienced, it will be seen that progress has been both steady and satisfactory in every line of rural production. Added to this, the fact that similar lines of export to the other Australian States rose from £1,400,000 in 1904 to £2,300,000 in 1906, and it will be seen that our progress may be described as phenomenal. (The map which was exhibited showed the area of cultivation in each county drawn to scale.) Yet this map makes it clear that agricultural development in Victoria is only just beginning. All the cultivation worth speaking about is north of the line of 20 inches of rainfall. In one or two of the wheat-growing countries, such as Moira and Tatchera,

one acre in five is under cultivation, but for the most part the development of our resources is only in the earliest stages. In Gippsland and most of the Western district the amount of land that has been brought under the plough is insignificant. Yet it has been abundantly proved that land which in its natural state will only run a sheep to the acre will carry three or four times that number when brought under a good system of rotation of crops. At the present time 260 acres of land near Dandenong are carrying 1,500 sheep.

THE QUESTION OF OVER-PRODUCTION.

With increasing wealth and better wages throughout the Northern Hemisphere there is little danger of over-production in any of our staple products. Great Britain alone has averaged importations to the amount of £224,000,000 in each of the past six years. The average contribution of the whole of Australia has only been about 10 per cent. of the whole. The list is as follows:—Value of importations into Great Britain in millions sterling. (Average of last six years.) Wheat, flour, 38; dead meat, 38; butter, cheese, milk, 31; other grains and meal, 25; sugar and farinaceous foods, 25; wool, 24; fruit and vegetables, 14; live animals, for food, 10; cattle and horse food, 9; hides, horns, tallow, 6; rabbits, poultry, eggs, 4. Total, 224. With such a market in one country alone, I do not think there is much danger of a sudden slump in prices. On the contrary, our true policy lies in increasing the production of wheat, wool, butter and lamb. The prices of all these commodities are ruled by the London market. In comparison with the world's production Victoria produces so little that a few million bushels or a few hundred thousand carcasses will make no appreciable difference. In wheat there are a number of varieties that have consistently given good results in our experimental plots. While the average yield for the State is less than 12 bushels, we have ten varieties which last season gave from 18 to 24. Our averages in the Mallee and the North-east have been 50 per cent. better than the average of the surrounding farms on the same class of soil. Then, again, it is evident that we want a general improvement in farm methods. The choice of a good variety and careful grading of seed may help; superphosphates are undoubtedly another very important help, but besides these we want to get into a system of rotation, to change the sequence of the crops and to admit of increased grazing. More sheep will not only mean more profit, but the manure from the animals will restore the humus to the soil and increase the fertility of the farm.

RAPE AND PEAS.

Rape is rapidly coming into favour for this purpose, but in districts where rape cannot be relied on I would call attention again to the points in favour of the field pea as a fallow crop. Rape requires early autumn rains, peas may be sown up to July. Rape occasionally fails to flourish, while peas succeed in nearly every district in Victoria. Rape may not be ready to graze till there is abundance of green fodder in spring. Peas may be left in the field till January or February, when the sheep will readily eat the whole crop, including any grain that may have fallen on the ground. In addition, peas increase the nitrogen supply of the soil, while rape does not. From experience in South Australia and from small plots in many parts of Northern Victoria, I am inclined to think that a hundred acres of peas would be a good experiment for most of you to try on your farms at once.

STIRRING THE SUB-SOIL.

At the Metropolitan Farm, Werribee, a plough has been in use for some years which stirs the soil to a depth of thirty inches without bringing any of the sub-soil to the surface. To all appearance the land is simply loosened and raised about six inches higher than the former surface of the soil. The cost of the operation is less than £1 per acre. The Rutherglen vignerons are taking steps to apply the same method to their vineyards before replanting. Now, I don't suppose that it will be advisable to work the wheat land so deep as this, but if we could stir the northern soils for 15 or 18 inches it is probable that great benefit would result. More of each winter's rain would be absorbed and retained for next season's crop. Just in the same way as the best crops in a dry year are secured from sandy land, so a deep stirring would put all the land in much the same condition. With a machine like that at the Werribee there would not be much difficulty from old stumps and roots, most of which would be broken or else rooted out bodily by so powerful an implement. If further experiment shows that the cost per acre is not excessive, I think the Oliver plough may help to improve our wheat yields. In this connexion the value of the well-worked fallow is becoming more apparent year by year. As a means of conserving the moisture and facilitating early planting, it is unrivalled, and should it be found impracticable to work it along with the pea crop, then I think the method will be to secure the benefit of both by growing a smaller area of wheat each year. The effort to grow a large area and consequently to half work the fallow is largely responsible for our small yields.

PLAIN LANDS AND THEIR TREATMENT.

In many parts of the north plain land may be purchased at half the price of the adjacent timber country. While this difference in value appears to correspond with the difference in grazing capacity, it is also a fact that the values of the two kinds for cultivation are not nearly so far apart. Cultivation is the way to get the best returns from the plain land, the fallow being followed by wheat and then by oats. If peas are introduced so as to increase the nitrogen (in which the plain land is deficient) and two or three years grazing follow the oats, the probability is that the difference between the two kinds of soil will disappear. The use of superphosphates is often blamed for burning the crop and exhausting the soil. These effects are due not to the super. but to bad management. Call in the assistance of a green crop, graze off this with sheep, and adopt some such rotation as that mentioned above, and the land will be kept in better heart for each succeeding crop. It is by some such system as this that the success of wheat growing in Northern Victoria is assured.

THE LAMB TRADE AND FODDER CROPS.

The question sometimes asked, "Which pays best, wool or wheat?" does not admit of an answer in Victoria. Here the one is the complement of the other, and both must be raised if we are to make steady progress. We have seen how the wheat provides for the sheep in regard to grazing off the early crop and how the rape and peas lead to increased fertility through the sheep. But it is not sufficient to stop at these crops. Wherever possible lucerne should be raised for the stock, and in addition oats should be grown and provision made for succulent fodder in the dry weather. Particularly for raising fat lambs the conditions should be such that

they receive no check from the first. This means that the ewes must be able to supply them with the proper amount of milk, and as in the case of dairy farming this is all a matter of feeding. In many districts we can find instances of farmers regularly hand feeding flocks of several thousand ewes, and I believe that this will soon become the regular practice. The details of the experience in feeding silage at Wagga, N.S.W.* shows that it does not cost more than 6d. per month when large numbers have to be handled. Suppose feeding goes on for three months in summer the cost would be 1s. 6d. per head, and there is no doubt that this sum would be recovered several times over in the additional profit on the lamb and the wool. The oat crop may be fed either as chaff or grain. Silage may be made of self-sown wheat and wild oats. In districts with a rainfall of more than 20 inches a paddock may be laid down in a mixture of fodders and grazed for three years before breaking it up again. At the farm near Dandenong already referred to the standard mixture is rape, prairie, rye grass and alsyke clover. The former two grow rapidly and furnish the winter fodder; they are succeeded in the spring by the rye grass and clover, which with the prairie form next year's grazing. Some such mixture as this is capable of wide application. One has only to see the results at the Werribee sewage farm to realize the value of superabundant feed for the sheep. In the hilly districts of Gippsland turnips should be grown. They form one of the chief supports of the industry in New Zealand.

FODDER FOR THE DAIRY HERD.

Similar considerations apply to the cow and the pig. The food must be sufficient in quantity and contain the right amount of the flesh-forming constituents to give the best results. One crop alone is not suitable. Some such catalogue as oats, peas, beans, maize, and mangolds ought to be provided. Possibly in some districts lucerne and maize alone will do, but variety has many and great advantages. Then again both dry and juicy food are of special importance to the dairy cow. Grazing on ordinary grass alone a cow will, on the average, eat from 15 to 18 tons of green fodder in the course of the year. She may be able to get plenty in November and December, but as soon as the seed is shed the quantity is small and the quality poor. In fact the dry grass, as soon as the seed shakes out, becomes grass straw instead of grass hay. This is the reason why milk production all over Victoria rapidly falls off at the end of the spring. If autumn rains are delayed then the financial losses suffered by the farmer are so great that they would ruin any other industry. Take the following characteristic paragraph, which shows that the dairy farmers have lost £45,000 in a single month as compared with May last year:—

> Returns of the arrivals of butter in Melbourne, and of the exports of perishable products, for the month of May show a great decrease in the production of butter. The total quantity of butter received in Melbourne was 827 tons, as compared with 1,271 tons for the previous May. The North-Eastern district showed the greatest falling off, while the West and South-Western district is faring the best. Among the exports for last month were 117,952 lbs. of New South Wales butter and 349 lbs. of Queensland butter, which was tinned in Victoria and reshipped to Eastern ports and Africa, bringing down the butter of Victorian manufacture exported to 976,856 lbs., or about half the total shipped for May, 1906. The

* See page 500 of this issue of the *Journal*.

following are the particulars of the arrivals of butter in Melbourne for May, 1906 and 1907:—

District.	May, 1906. Tons.	May, 1907. Tons.
North-Eastern	275 ...	108
Northern	100 ...	57
Gippsland	508 ...	296
West and South-Western	388 ...	366
Total	1,271 ...	827

CULTIVATION IS ESSENTIAL.

The time is past when land in Victoria might be obtained so cheaply that it would pay to trust to grazing alone. Everyone who takes up land must make up his mind that seed-time and harvest-time are to come round year by year with the regularity of the seasons. Part of the produce so raised may be sold direct as such, but the greatest part is to be fed to the live stock on the farm. If it is said that it will not pay to grow food for live stock the following facts should be carefully weighed. Granted a man with one horse and single furrow plough broadcasting both seed and manure in the old fashioned way. Under these circumstances the cost of putting in the crop will be from 15s. to £1 per acre. In the suburbs of Melbourne you may get any little irregular paddock cut with the reaper and binder at 10s. per acre. The total maximum cost therefore is from 25s. to 30s. Suppose the harvest yields 20 bushels of peas, or 30 of barley, or a ton and a half of oaten hay. Grain at a shilling a bushel or hay at £1 per ton is so cheap that it is impossible to feed them to any good class of live stock without securing a handsome profit. On the score of profit every farmer should use his plough. But there are two other equally cogent arguments. The Australian climate is dead against continuous grazing. The superabundant growth of spring soon dries up in summer, and as we have seen, instead of grass hay there is nothing but grass straw to be found for the stock. Then again, by long centuries of selection the most prolific plants are those which are cultivated, and with the single exception of lucerne it may be said that an acre of cultiation will yield from four to eight times as much fodder as the same acre of land under grazing.

These ideas with regard to the importance of the question of fodder for the dairy herd have been emphasized by the information received from several parts of the State since the passing of the *Milk and Dairy Supervision Act*. The purchase of bran at the present time absorbs much of the profit from the cow. In some cases dairy farmers supplying milk to the cities require to secure returns of £10 to £12 per head before they begin to make any profit. A small area well cultivated is the remedy for this state of affairs. In country districts the profit from the pig should pay the expense of growing the crops for the herd.

It will be seen then that I look upon the production of more fodder whether for sheep or cattle as the chief problem in the immediate future. The results already obtained are so good in both these branches of agriculture that there is no doubt about the success of the movement. A man with rich land may venture to trust to natural conditions alone; but all our second class land requires the plough to start it on the up grade. All our great export staples may thus be easily doubled.

II. POSSIBILITIES AND LIMITATIONS OF VETERINARY SCIENCE.

W. T. Kendall, M.R.C.V.S., Principal, Melbourne Veterinary College.

Had the Chamber of Agriculture served no other purpose than that of obtaining a proper recognition of Veterinary Science by the State it would still have justified its existence. Fortunately its able and persistent advocacy of those claims was brought to bear upon a Minister whose training enabled him to appreciate the value of applied science and the result has been the establishment of a nucleus of a State Veterinary Department under the direction of Mr. S. S. Cameron, M.R.C.V.S. Another outcome has been the decision to provide for State Veterinary Education in connexion with the University of Melbourne, and the establishment of a Research Institute where diseases of animals will receive scientific investigation.

The value of these innovations can only be estimated when we consider the enormous losses the country has sustained in the past for want of them. It was owing to the absence of veterinary inspection and quarantine regulations that scab in sheep, pleuro-pneumonia in cattle and other infective diseases were allowed to be introduced by imported animals, and make such ravages amongst our flocks and herds; and it speaks well for the effectiveness of the system now adopted that no serious disease has since gained a footing in this manner.

Notwithstanding this there never was a time when greater vigilance was needed than now. The increasing trade relations and rapid transit between Australia and South Africa, South America, India, Japan, Java and the Philippines, where more serious diseases exist than any hitherto experienced here render due precautionary measures imperative. I need only mention cattle plague, horse-sickness, nagana, glanders, epizootic lymphangitis, dourine, surra, and mal de caderas among the diseases affecting domesticated animals in these countries to show the extreme risk we are running.

The greater danger is from travelling circuses and menageries for, although the animals may be free from disease, they are travelling about in countries where infective diseases exist and may become bearers of infection. Some years ago glanders was found to exist among horses connected with an American circus which were about to be landed in Sydney, and had it not been for the vigilance of Mr. Stanley, the Government Veterinarian, the disease would in all probability have been well established in Australia. Fortunately it was correctly diagnosed in time, the diseased animals were slaughtered and the rest quarantined on an island so that they never reached the main-land and were re-shipped to America.

There should be uniform quarantine regulations in all the States or, better still, Federal quarantine laws. In the event of any disease showing itself in imported animals, or even a suspicion of such, the shortest method of dealing with it should be made possible; for, like putting out a fire, everything depends upon an early start and no round-about red tape methods would allow of this. The possibility of disease being introduced from abroad by other means than by diseased animals was proved a few years ago when two or three outbreaks of anthrax were traced to feeding the cows on bone meal made from imported bones. There is, however, no further risk of this as such bones have now to be sterilised before distribution.

The old saying that "health is wealth" applies to domestic animals as well as man and the best use to which a knowledge of veterinary science can be put is the prevention of disease. As there are something like thirty diseases of domestic animals that are directly communicable to human beings to say nothing of others that injuriously affect the flesh as well as milk and its manufactured products, the importance of preventive veterinary medicine is obvious.

WHAT VETERINARY SCIENCE IS DOING FOR THE STOCK OWNER.

It may be, therefore, well to pass in review here the efforts that are being made to safeguard the stock-owners' interests as well as the public health. Our first line of defence then is directed to guarding against the introduction of diseased animals from oversea countries, and consists of the veterinary inspection and quarantining of all imported animals. This includes tuberculin and mallein testing and other up-to-date methods of examination before debarkation and before releasing from quarantine. The second line of defence consists of a staff of stock inspectors appointed under the *Diseases in Stock Act*, whose duty it is to deal with outbreaks of disease, seeing to the destruction of diseased animals, quarantining and disinfecting premises and inspecting farms. Then there is the newly appointed staff of veterinary surgeons and dairy supervisors who have charge of the health of dairy herds and who, notwithstanding the resentment at first shown to the *Dairy Supervision Act* and the officers appointed to administer it, are doing a great amount of good with the minimum of friction. Indeed, dairymen are beginning to see the advantage of falling into line and accepting the latest teaching of sanitary science and up-to-date methods.

The inspection of fat stock markets and abattoirs is not only a safeguard against meat of diseased animals getting into consumption, but affords a fairly reliable index to the number and character of the constitutional diseases affecting our flocks and herds, and a means of tracing them to their sources. The inspection of meat, rabbits and poultry for export is also an assurance to consumers abroad that the necessary precautions are being taken to keep our live stock free from disease.

VETERINARY EXAMINATION OF STALLIONS.

There is another matter to which I will now refer, viz., the action taken by the Agricultural Department in providing for the veterinary examination of stallions standing for public service and giving certificates of soundness and approval. This as well as insisting upon all prize animals at subsidized shows being awarded to sound animals only, is a step in the right direction. The examining and certifying to the soundness and suitability of stallions for public service is a matter the importance of which can only be realised fully by those who have made the soundness of animals a special study.

Twenty-five years ago unsound horses were so few and far between that the question of soundness never seriously entered into the calculations of breeders or purchasers of horses. The individual values were so low that it was a matter of indifference whether the horses turned out sound or not. In fact so little was this regarded that I have seen £1,200 paid for a stallion that could be heard roaring at a walk. This utter disregard for the first essential in horse-breeding has had most disastrous results for, instead of finding unsound horses the exception as formerly, one finds they form the majority of those now examined. This is a matter which

more directly affects the user than the breeder of horses for he finds that instead of getting an average of eight or ten years' work out of his purchase the majority of horses break down and become unsound and worn out before they have worked half that time. At least seventy-five per cent. of the horses working in the streets of Melbourne are unsound and one-third of these are perceptibly lame.

So long as unsound stallions receive patronage so long will this deterioration go on and breeders remain indifferent. It is all a question of immediate profit. If this were not so they would not be kept. By issuing certificates for stallions sound and free from defects of conformation owners of mares will know where they can obtain the services of an approved stallion. It may be said that, while it is desirable that a veterinary certificate of soundness be issued, the question of conformation should be left to the owner. Now a stallion might turn out to be quite free from hereditary or other unsoundness and yet be a most unsuitable animal for a sire, and it is quite right that in such cases the certificate should be withheld.

Stallions untested by work of any kind are less likely to develop unsoundness than working horses; and after all most hereditary forms of unsoundness are due to defects of conformation such as weak hocks, upright pasterns, etc. Horse breeders and owners are not necessarily good judges as to soundness, in fact, those well up in years had little opportunity of becoming so in their youth and many are still inclined to doubt the existence of so much unsoundness. The younger generation, however, will be wise to give heed to such matters. Stallions to be approved of require other qualities than soundness and symmetry. We have all seen sound well-proportioned horses that were not worth their oats. When put to the test of every-day work character counts as much as anything.

The Government Grant for Improving Horse-Breeding.

I do not hold with the idea of subsidising stallions. Good stallions do not need it and unless the services of subsidised stallions were confined to approved mares more harm than good would be done. The sum of £3,000 is much too small to make any perceptible improvement and the circumstances are totally different from those of countries where subsidies have been found successful.

Horse-breeding is being carried on in a most haphazard and unsatisfactory way. There is plenty of good material but it wants selecting and classifying and the industry must be regulated and controlled if any serious attempt at improvement is to be made. To give an instance—dozens of strong-limbed compact thoroughbred colts that would make splendid sires of Indian remounts are castrated every year because they are not likely to develop speed enough for the turf. Some of these should be selected and encouragement given to owners to rear them as stallions. I will, therefore, offer the following suggestions:—

1. That the State be divided into five or more districts and that in each district a stud stock committee consisting of two good judges, preferably breeders, one of light and the other of draught horses, and an experienced veterinary surgeon be appointed.

2. That all stallions for public service be paraded at certain specified centres in each district where they can be inspected by the committee and classified into 1st, 2nd, and 3rd class—a certificate or licence be given to all approved stallions. The certificate to state what class of mares

each stallion in the opinion of the committee is most suited for and to be available only for the season in which it is issued.

3. That a register of all licensed stallions in each district be kept by each committee.

4. Any owner who allows his stallion to serve mares of low grade or known to be affected with any hereditary unsoundness may have his certificate withdrawn and licence cancelled.

5. Any stallion of the first class failing to leave satisfactory progeny may be placed in a lower grade and any lower class stallion found to leave good foals may be raised to a higher grade.

6. No unlicensed stallion to be allowed to stand or travel for public service.

7. The expenses of the district committee to be paid out of the Government grant and any surplus to be devoted to importing donkey jacks to stand at nominal fees in the poorer districts and so encourage mule-breeding.

The stud stock committees would act as advisory boards and instruct breeders how to select and mate suitable sires and dams, and so regulate and improve the methods of breeding; and I venture to say that the grant would do much more good if spent in this way than in subsidizing a few stallions. Later on breeders might consent to have their mares classified and have certificates issued to them so as to give the progeny a higher market value. Mares unsuitable for horse-breeding might be used for breeding mules with good results and thus curtail the breeding of worthless low-grade horses.

STATE VETERINARY EDUCATION.

The question of State veterinary education is now on the tapis and a committee has been appointed to formulate a curriculum. By bringing it under the control of the University Council candidates should have better opportunities given for scientific training and of obtaining a higher state of efficiency. For some years there has been a gradually increasing number of veterinary surgeons turned out to meet the requirements of stock owners and the appreciation in which their services are held may be inferred from the fact that subsidies from £50 to £175 per annum have been given by agricultural societies as inducements for them to settle in certain districts. As an indication of the value of and necessity for this encouragement I may state that one of these subsidized veterinary surgeons had no less than eighty foaling cases to attend last season so that, had his services been requisitioned for this work alone, he would still have saved some thousands of pounds worth of stock for his clients.

PROPOSED RESEARCH INSTITUTE.

The proposed Research Institute is also much needed to enable thorough investigations being made into the nature and causes of obscure diseases which are continually making their appearance. As this work is for the immediate benefit of the stock-owners every help and encouragement should be given to it by them. While specialists are needed for the laboratory work some of the most important work will have to be done on the spot for, without the necessary data obtainable only from practical field work, little good will be done.

VETERINARY TEACHING AT AGRICULTURAL COLLEGES AND CLASSES.

The diffusion of veterinary knowledge amongst stock-owners is not being neglected. There is a teacher of veterinary science connected with the

agricultural colleges who instructs the students how to deal with common ailments and on the principles that should guide them in the selection, care and breeding of animals. Amongst the lecturers to agricultural classes held at the different centres throughout the State there is also a veterinary surgeon who gives both theoretical and practical instruction to young farmers. Valuable information is also diffused through the columns of the *Journal of Agriculture*, so that those who desire it need not now lack information on matters relating to the health and soundness of their stock.

HORSE-SHOEING.

Horse-shoeing is also an important matter to all who have to use horses, and requires more attention than it has hitherto received. Owing to the discontinuance of apprenticeships this trade like many others has suffered and unless measures are adopted to raise the efficiency of those engaged in it there is some risk of its becoming a lost art. The injurious effects of bad shoeing are not seen to the same extent in the country as in the larger centres of population although they exist, and it behoves every one who has anything to do with horses or has any love for them to use his influence in bringing about a more satisfactory state of affairs. This will be better understood when it is realized that one-third of the useful life of working horses is sacrificed to bad shoeing. A Farriers' Bill has been drafted which, it is to be hoped, will be brought before Parliament at an early date. This Bill provides for the proper teaching and examination of those entering the trade. If it is necessary to examine a plumber or engine-driver before granting him a licence, surely a man who has to deal with a living sensitive animal should prove himself competent before being allowed to practise his trade.

WHAT VETERINARY SCIENCE CAN *NOT* DO.

Having said so much about what the veterinary profession can do and is doing for the stock-owners, I shall now mention a few things that it cannot do. It should be understood that when animals lose their freedom as they do when brought into a state of domestication, Darwin's law of survival of the fittest ceases to operate. In the natural or wild state the weak, diseased or incompetent fail in the struggle for existence and die, leaving only the strongest and most robust to perpetuate their species. Under domestication man takes the law into his own hands and only allows those to breed which he thinks fittest—that is—fittest for his own purpose. The result is that very often the least robust are carefully fostered and reared to propagate others still less fitted for the struggle for existence, and such animals are necessarily predisposed to disease. To enjoy health and vigour animals must be adapted to their surroundings. Any failure in this respect leads to disease. Much can be and is being done in the way of adjusting the surroundings to suit the altered character of the animals such as providing shelter, clothing, growing forage crops, storing ensilage, making hay, etc. But unless the balance between adaptation and environment is complete we may always expect trouble.

WHY ANIMALS SUFFER FROM DISEASE.

Herbert Spencer says that life is a continuous adaptation of the internal to the external relations, and it is this great principle we must all study if we wish to reduce disease to a minimum. Endeavouring to keep animals alive with medicine is only a temporary expedient though sometimes a very necessary one. Every farmer knows that some districts are

more suitable for sheep than either cattle or horses and that good cattle country is not necessarily good horse country. Unusual seasons too, which affect the ordinary food and water supply, also upset all our calculations.

We have commenced an era of closer settlement which entails a more restricted form of domestication for our animals, and it becomes necessary to have all kinds of farm stock on the same land. This may result in a larger number of diseases making their appearance. The more restricted life reduces the animal's choice of food and water, and the conditions of existence become more artificial than ever. We produce animals more suitable to our requirements, but the balance between adaptation and environment becomes more difficult to maintain at every stage. Is it then any wonder that veterinary science is taxed to the utmost and may fail to point at once to the exact cause of a disease or the best way of avoiding it? The mischief is done before the disease declares itself and the changes required take time to accomplish.

It is to such problems as these that the best efforts of the scientists are being directed. Stock-owners should study the causes of disease. They have better opportunities of doing so than veterinary surgeons. Close observation is needed to get definite information. We have to remember that when external influences exceed the limits of endurance disease is the inevitable consequence. Whether harm will result depends upon the inherited potentialities of the animal, the functional activity of its cells, and its protective and regulative mechanism. Sensitiveness to noxious influences is known as susceptibility or predisposition, resistance to disease as immunity. Resistance differs in different species of animals, in different animals of the same species and in the different organs and tissues of the same animal. Fortunately, we find that domestic animals possess great adaptability—the same species surviving the rigours of a Canadian winter or a tropical summer. This adaptability is greatly aided by man's intelligent care. If he did not provide winter food and shelter the majority would probably succumb.

Wild animals collected in zoological gardens suffer more from change of climate and surroundings, and it is only with difficulty that some of them can be kept alive even for a short time. In all outbreaks of infectious diseases there are always a few animals that remain unaffected or are so slightly affected as to recover and live to perpetuate their species. Some diseases affect one species only, while others are easily transmitted to animals of other species. Pleuro-pneumonia in cattle, strangles in horses, distemper in dogs are examples of the former; tuberculosis, anthrax and rabies represent the latter.

The resistance of different tissues is exemplified in certain diseases always attacking certain organs or parts and not others. Pleuro-pneumonia for example attacks the respiratory organs only, while tuberculosis may invade any part of the organism.

Whilst such predisposing causes as hunger, starvation, bad or unsuitable food and water, over feeding, over exertion, excessive breeding or milking, absence of shelter, wounds and injuries, parasites such as ticks and intestinal worms, exist, disease will continue to exist in spite of the best efforts of the veterinarian. These are the dangers to be avoided if disease is to be prevented or eradicated.

WHAT EXPERIENCE TEACHES.

Practical experience teaches the stock-owner that certain breeds of cattle are suitable for certain districts whilst others are less so. Ayrshire

cattle do well on country that would be too poor and bleak for the shorthorn. The selection of the right class of animals for his farm is therefore a matter of the first importance if they are to be kept in sound healthy condition, and it is in collecting and using reliable data on such matters that the best results are to be looked for. It is only a temporary expedient to feed bone meal to cattle affected with rickets. It is the soil that requires the elements of bone. The same reason applies to giving repeated doses of Epsom salts or linseed oil to cattle with impaction caused by feeding on old dry grass. What is wanted here is green feed or ensilage to tide over the dry season.

In the past veterinary surgeons have profited chiefly by the stock-owners' mistakes and misfortunes, but with the inauguration of a State Veterinary Service, the more important work of prevention will receive attention. To ascertain and thoroughly understand the causes of disease requires the exercise of the highest faculties, and it is only by the acquisition of reliable knowledge that we can hope to give the stock-owners and the State the full benefit of our services.

I have endeavoured to show in as few words as possible that disease in all its phases is the result of external influences exceeding the limits of endurance and that anything upon which the animal depends such as air, light, food, water, shelter, etc., if absent, deficient or unsuitable may cause disease. There is an old saying "remove the cause and the effects will cease." If we cannot remove the cause from the animal we must remove the animal from the cause or it will be removed for us.

I have further endeavoured to show that every effort is being made both publicly and privately to meet the veterinary requirements of stock-owners and to render available the latest teachings of science. Although the number of veterinary surgeons is yet small some good has already been done, but much more remains to be done to reduce the losses from preventible diseases. Many of those dreaded plagues which were formerly looked upon as punitive visitations for human delinquencies have been brought under control, and, as etiological and pathological science advance, others are being constantly added to the list.

Veterinary science is destined to be of greater service to the stock-owner in the future than ever it has been in the past and he will do well to encourage it in every way; more particularly that branch specially devoted to the prevention of disease so as to make the live stock industry safe and more profitable.

III.—THE SOIL: CONSIDERED AS THE FARMER'S CHIEF ASSET.

F. E. Lee, Agricultural Superintendent.

If I were asked what, in my opinion, was the most pressing need of the Victorian farmer of to-day I should have little hesitation in replying "a better knowledge of the capabilities of the soil he cultivates." This conclusion has been arrived at after a careful study of the farming practice in every part of the State, and is substantially borne out by the chemical and mechanical analyses of a large number of representative types of soil.

To put the matter upon an easily understandable basis, we can regard the soil in the light of a banking account of greater or less magnitude according to its physical condition, and the amounts of the elements of plant food stored therein by Nature. Good farming means the utilization of this wealth in such a manner that not only is the original capital not

diminished but, if anything, is increased, while a profitable income is derived from the various products of the soil. It is the interest on our soil capital which we should live upon and not on the capital itself. This being so it is somewhat surprising that many farmers operate on only such a small proportion of their soil capital or in other words only give the crops they produce such limited feeding ground by imperfect methods of cultivation. In order to completely understand what is meant by the fertility or producing power of the soil the following influencing factors may be named :—

1. The water holding capacity which is largely controlled by the presence of organic material.
2. The porosity or natural drainage which depends upon the size of the soil particles.
3. The capillary power or power to move water from the subsoil to the surface.
4. The temperature which is regulated by the natural powers of drainage, colour, and texture of the soil.
5. The presence of plant foods.

You will note that prominence is given to those factors which have to do with the storage and retention of moisture. The most fertile soil in the world is powerless to produce crops if moisture is lacking, and for that reason, I direct pointed attention to the need of improvement in that direction in many of the heavier types of Victorian soils. Shallow cultivation of soils having a stiff impervious clay subsoil means only a limited storage of moisture and hence the yield is regulated almost entirely by the amount of moisture at the disposal of the crop.

The ploughing in of the remains of crops and grass roots, at all events, occasionally, is something of a set off to the extravagant burning of the stubble, so unfortunately common in the wheat growing districts. The growth of crops suitable for ploughing in or feeding off and the return of animal manure to the soil are all means by which an improvement is effected in the water holding power of the soil. Soils vary within wide limits as regards their natural powers of drainage, sandy soils being of course the quickest in this respect and clay soils the slowest. Extremes of either type are not the most prolific producers of crops. It is however by deep cultivation drainage and the use of lime, where necessary, that clay soils may be assisted to store up moisture in greater quantities without rendering the land cold and unproductive.

Sandy soils have only poor capillary powers and for this reason we sometimes find shallow rooted plants suffering from want of moisture, although there may be an abundance within 2 feet of the surface but unable to rise up to the roots of the crop. Clay soils on the other hand have very strong capillary powers, and we invariably find that this type rapidly forms a crust on the surface and loses moisture rapidly in warm or windy weather. The loss of moisture is checked to a large extent by keeping the surface mulched or loose thereby minimizing evaporation.

The temperature of the soil plays a much more important part in the production of crops than many farmers give credit for. Poorly drained land is always cold and slow to respond to the genial influences of spring. The reason is not far to seek. Evaporation is always a cooling process and when the surplus moisture has to be evaporated by the sun's warmth in the spring, growth only proceeds slowly until the land becomes warm enough to permit those wonderful activities to take place which we are so familiar with under the name of spring growth. The germination of

most seeds is best effected at a soil temperature of from 60 to 65 degrees. Drainage therefore, whether by natural means or otherwise is no unimportant factor in regulating the amount of production. A highly interesting confirmation of this fact is being shown at the present time on the subsoil section on the experimental fields throughout the wheat growing areas. Germination has been more rapid and growth is more vigorous on these deeper cultivated portions of the field than where the land has been cultivated in the ordinary fashion, due no doubt to the better drainage conditions.

So far we have viewed the physical condition of the soil and seen how far-reaching are the effects of proper cultivation and soil treatment generally. The presence of the four most important elements of plant food—nitrogen, phosphoric acid, potash, and lime—is equally important, and it is in this direction that the Agricultural Chemist has given such valuable assistance and which in my opinion, merits still more detailed systematic investigation in the future.

ECHUCA SOILS.

For the purpose of illustrating the practical value both to the individual farmer and the State generally of acquiring more information in connexion with our Victorian soils, I have had collected some sixteen samples from the Echuca district, which are representative of fairly considerable areas of each type within 10 miles of the town. It is not claimed that these are the only types in this district, but they are sufficient in numbers to be eloquent testimony of the need for a better understanding of the whole question. The ten samples represented in the glass tubes show the greatest variations in colour and texture.

CHEMICAL AND MECHANICAL ANALYSES OF SOILS IN THE ECHUCA DISTRICT, 1907.

Name and Address.	Depth.	Classification.	Chemical.					Mechanical.			
			Nitrogen.	Phosphoric Acid.	Potash.	Lime.	Chlorine.	Gravel.	Sand.	Clay.	Organic Matter.
Miss Robertson, Wharparilla	Soil	Clay soil ..	.226	.036	.433	.428	.013	.12	26.78	59.69	7.00
	Sub.	.. ..	.081	.056	.696	1.392	.005	.43	14.93	70.07	5.99
Miss Robertson, Wharparilla	Soil	Sandy loam	.142	.054	.250	.304	.008	.05	62.60	30.44	4.85
	Sub.	..	.067	.064	.249	.170	.008	..	53.10	38.84	4.12
Mills Bros., Wharparilla ..	Soil	Sandy soil	.036	.012	.104	.148	.008	.54	89.66	8.10	1.12
	Sub.	..	.018	.044	.188	.210	.008	.39	66.65	26.51	2.45
McSwain, S., Wharparilla ..	Soil	Clay soil ..	.131	.078	.633	3.410	.011	..	16.05	64.51	9.33
	Sub.	,, ..	.037	.062	.501	3.818	.007	.15	14.50	65.10	9.18
McSwain, S., Wharparilla ..	Soil	,, ..	.056	.040	.450	.235	.113	[illegible]	19.25	[illegible]	[illegible]
	Sub.	,, ..	.039	.049	.457	.410	.213	.11	2.70	80.02	7.15
Dobson, G. R., Millewa ..	Soil	,, ..	.106	.087	.855	1.024	.036	.20	9.95	72.04	8.29
	Sub.	,, ..	.031	.048	.773	1.148	.014	.47	9.51	72.91	6.90
McDonald, D., Torrumbarry	Soil	,, ..	.081	.076	.274	.136	.012	.09	8.05	65.61	3.86
	Sub.	,, ...	.053	.057	.269	.170	.010	..	11.95	72.29	5.82
Braund Bros., Wharparilla	Soil	,, ..	.131	.081	.417	.170	.006	.40	14.75	74.50	6.49
	Sub.	,, .	.056	.030	.480	.162	.013	.40	8.15	78.40	5.16
Mactier, A., Echuca North	Soil	Clay loam	.179	.060	.348	.484	.003	.25	25.70	63.72	3.07
	Sub.	,,	.075	.048	.462	.324	.006	.90	23.35	64.49	5.03
Mactier, A., Echuca North	Soil	Loam ..	.075	.078	.319	.202	.003	.65	46.85	46.80	2.96
	Sub.	,, ..	.058	.013	.451	.276	.007	.35	28.55	58.02	4.97

Sandy soils ..	Over 80 per cent. sand.	Clay loam ..	25–40 per cent. sand.
Sandy loams ..	60–75 per cent. sand.	Clay soils ..	60 per cent. clay.
Loam	40–60 per cent. sand.		

A criticism of the chemical composition of these soils reveals a series of highly interesting facts and throws a flood of light on the question of correct methods of cultivation and manuring. For example, the average composition of the surface soils and subsoils is as follows:—

—	Nitrogen.	Phosphoric Acid.	Potash.	Lime.
Surface soil	·116	·057	·408	·626
Sub-soil	·056	·047	·452	·808

These figures confirm a fact which has long been known to investigators of Victorian soils, viz., that many of the northern subsoils are almost as well furnished with plant foods as the surface soils. This plant food, however, is of little service with the present shallow cultivation continued year after year at the same depth. What appears to be necessary is either a system of cultivation which will stir the soil deeper without bringing the subsoil to the surface or else the growth of tap rooted plants whose habit of growth will permit them to find food at a depth of 8 or 10 inches from the surface. This idea of deep cultivation is by no means new, and as already stated has formed part of the Department's experimental work in the wheat districts during the past three years. The results are sufficiently far advanced to say that in the northern and north-eastern plain districts this mode of cultivation has shown sufficiently increased yields to justify the extra cost of preparation. It will be noted in particular that the subsoils are nearly as well supplied with phosphoric acid as the surface soils, and this store of plant food in the former should be unlocked by cultivation.

It is astonishing to find what an enormous cash value per acre the plant foods in the surface 30 inches of soil represent. Allowing a value of 9s. 6d. per unit for the nitrogen, 4s. for the phosphoric acid, and 5s. 6d. for the potash, we can say that the average commercial value per acre of the plant foods in the samples shown in the glass tubes is as follows:—

Nitrogen	£85
Phosphoric acid	17
Potash	37
	£139

This is not, of course, the commercial value of an acre of land, but it represents the potential wealth locked up in the soil which can only be gradually drawn upon by intelligent working. There is little need to pursue the subject further. The object of this paper will have been well served if it succeeds in fixing the attention of the farmer more on the cultivation of his soil, as being the most economical way of assisting it to yield up its latent wealth.

As the population of the State increases and the price of land rises there is little doubt that a demand will be created for more knowledge of the potential wealth of the soil. To meet that demand, it will, in my opinion, be necessary for the Department I represent, to accumulate such information bearing on the chemical and physical condition of the soils of every district in the State. By this I do not mean to convey the idea that anything in the nature of a comprehensive soil survey is necessary, but I look forward to the time when every Agricultural Society and rural body in the State will have a collection of the typical soils of their district

mounted as you see them together with all the information possible to collect, bearing on the economical fertilization, correct methods of cultivation and suitability for special crops. This may appear a stupendous task, but in reality it could be very easily carried into effect by securing the co-operation of the farmers themselves as honorary collectors of soil samples. The classification and analytical portion of the work could be carried out by the Department sufficiently promptly to enable the prevailing types in several districts being published every year.

As an assistant to the important problem of closer settlement, I venture to say that the work outlined would be of immense value to the State in placing people on the land under conditions which would permit of its affording them an income proportionate to the amount of skill and energy brought to bear upon it.

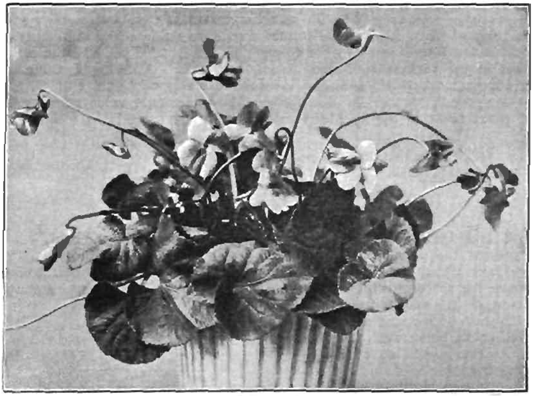
The Convention Papers will be continued in the September number.

GARDEN NOTES.

J. Cronin, Inspector Vegetation Diseases Acts.

The Violet and the Pansy.

The garden forms of violet and pansy have been derived from Viola, a genus of dwarf plants, mostly perennial in growth, species of which



VIOLET, SINGLE FLOWERED. "PRINCESS OF WALES."

have been found native in many parts of the world. There is a great number of species of violas, but only a few are cultivated except in botanical collections. All are low growing plants, and naturally occur in cool and shady situations.

The sweet violets, *Viola odorata* and its variety *alba* are natives of Britain, and are found growing in the fields and hedge-rows. The present garden types of violets have been raised from this species, and while the flower has long been popular on account of its perfume and time of blooming, the interest in it has largely increased of late years owing to the improvement that has been effected by gardeners in increasing the size and introducing more varied colouring in the flowers and vigour in the plants, without diminishing the characteristic perfume. The single varieties in particular have been greatly improved. The double flowered violets have been produced from a variety of the common violet, *Viola odorata* var. *pallida plena,* the Neapolitan violet. The double types, though not as hardy as the single kinds, are also popular garden plants, flowering freely under suitable conditions. The flowers are delightfully fragrant, in many varieties the perfume resembling that of the wall-flower. Violets thrive in the Southern and elevated districts of this State but require some protection in the hot Northern districts, particularly where the soil is of a sandy nature. They endure a deal of heat if the soil at the roots is moist and cool.

The violet succeeds best in a fairly heavy soil that has been deeply worked and moderately manured. An excessive quantity of nitrogenous manure will cause the production of an excess of gross foliage and very little bloom. The usual position assigned to violets is that of edging plants, for which purpose they are specially suitable. The single flowered varieties will thrive in any aspect excepting an excessively shaded one, but the double varieties require a rather shaded position unless the soil is cool and moist. Red spider is the principal insect pest of the violet and is difficult to exterminate owing to its attacking the under surface of the leaf. When the plants are badly affected the leaves become yellow in colour and should be cut off and burned; in the case of plants newly set out, the application of water is necessary.

Violet plants bloom freely for two seasons, after which they become weak and straggling in habit, and the flowers produced are poor and few. The plants should be renewed after the second year, fresh soil being necessary to insure success. Strong sturdy runners with roots attached should be selected, and planted either in the spring or autumn. The plants should be mulched with rotted manure early in summer.

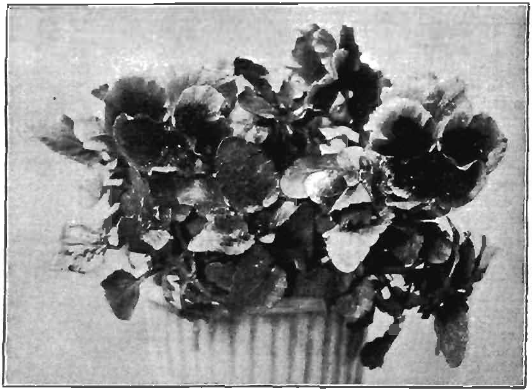
The principal varieties are:—Double flowered: Neapolitan, and De Parme, pale mauve; Marie Louise, lavender blue; New York, violet; Lady Hume Campbell, mauve; Count Brazza, white; Madame Millet, rose; and King of Violets, dark blue. Single flowered: Admiral Avellan, purplish red; California, violet purple; La France, violet blue; Italia, violet; Margaret, violet; John Raddenberry, pale blue; White Czar, white; and Princess of Wales, violet purple, the popular market variety, and the best violet in cultivation.

The pansy of to-day is a descendant of *Viola tricolor,* also a native of Britain. Like the violet it succeeds best in cool districts, but can be grown to produce its flowers during winter and spring in any part of the State. Pansies are divided into three sections, viz., the Show, Fancy, and Tufted or Bedding pansy, the latter being also known by the generic name Viola. The show pansies are mostly self-coloured white, black, yellow, &c., and are of medium size. The most popular section here is the fancy pansy, the plants being stronger, and the blooms larger and more varied in their colouring and markings than the show varieties. The fancy pansy is of Continental origin and has been greatly improved of

late years by English horticulturists. The tufted pansies partake more of the character of the show pansy than the fancy, but are hardier than either, enduring a deal of summer heat without injury.

The pansy thrives best in a fairly porous loam that has been deeply worked and enriched. Heavy dense soils need an admixture of sand, grit, or ashes, to make them sufficiently friable and porous, while light and sandy soils will be rendered more suitable by the addition of clay or strong loam, and cow manure. Although a perennial plant the pansy is usually treated in Victoria as an annual.

The increase of specially fine varieties is effected by striking cuttings,—produced in the centre of the plants after blooming—in sandy soil in a cold frame, or by dividing the plants. Generally a fresh batch of plants is raised from seeds each season in most parts of the State. The



PANSY, FANCY TYPE.

plants are nearly certain to be attacked by red spider during summer, and it is considered more profitable to destroy the plants and raise a new supply from seeds, than to attempt to cope with the pest. To raise plants that will begin to flower early in winter, the seed should be sown about the end of January in boxes of light soil placed in a sheltered situation or cold frame. The seedlings may be transplanted into beds and sheltered during very hot weather until the autumn, when they should be planted in their flowering quarters. The position selected should be open and sunny, the edge of an exposed border being suitable. Seeds sown in the open ground during winter or spring will produce plants that will bloom during summer and autumn if the position selected is sheltered and moist. Plants intended for late flowering should be mulched and liberally watered during summer to promote growth and check the red spider. Several strains of pansy seeds are offered for sale by local seedsmen, one of the best being Bath's "Empress" a noted strain of fancy pansies.

Flower Garden.

Pruning of roses should be completed by mid-August in the greater part of the State. In cold and late districts the operation may be deferred till later, but when the growth buds are showing prominently along the shoots, the dormant season has passed and pruning should be finished. Roses were badly infested by aphis during autumn and winter, and close observation will probably show that the buds on the shoots that remained after pruning are still infested. The plants should be cleaned at once, and prunings burned or buried deeply. A strong soap or tobacco wash, or a mixture of each, will destroy the aphides, and no harm will ensue if the application is sufficient to drench the soil at the base of the plants. An infusion of tobacco should be used, not a boiled and comparatively useless solution. One thorough spraying is necessary, which should be repeated if any aphides are present a few days later.

Divisions of herbaceous plants may be planted. Many of the finest summer flowering plants are of this class, and will repay, by abundance of fine flowers in season, a thorough preparation of the soil before planting. The tall and large leaved kinds, such as cannas, require a deep and well enriched soil to assure a supply of moisture at the roots, sufficient to maintain a large evaporating surface of foliage during dry weather. Plants with abundant leafage need abundant moisture and cool soil during summer. When the plants are set out and sufficient water applied to settle the soil around them, a mulching of stable manure will lessen the need of after watering. The surface should be reduced to a fine condition before applying the mulch. Herbaceous plants suitable for most parts of the State are delphinium, perennial phlox, canna, pentstemon, heliantbus, dielytra, shasta daisy, oriental poppy, peony, tritoma, hemerocallis, rudbeckia, salvia (herbaceous). Bulbs of gladioli may be planted to flower early and divisions of dahlias for the same purpose. Seeds of hardy annuals may be sown, and transplantings made from sowings in autumn.

Vegetable Garden.

Ground should be in readiness for planting out from former sowings, and sowing seeds of most vegetables in demand during the summer. In limited areas, if the soil is suitable, vegetables that require to be used quite freshly gathered to give satisfaction should be grown. Herbs and saladings are worthy of consideration and can be grown well in small gardens. The class of vegetables grown should be changed as often as possible. Better results are obtained by a quick rotation, and also greater immunity from insect and fungoid attacks. Growing crops should be thinned, and kept free from weeds. The hoe should be kept going between the rows, and the soil brought to as fine a condition as possible.

THE PROCLAIMED PLANTS OF VICTORIA.

(Continued from page 438.)

Alfred J. Ewart, D.Sc., Ph.D., F.L.S., Government Botanist; and J. R. Tovey, Herbarium Assistant.

The Chinese Scrub.

Cassinia arcuata, R. Brown. (Compositæ.)

An erect shrub of 5 or 6 feet, the branches and undersides of the leaves thinly woolly. Leaves narrow linear, rounded at the ends, or with short recurved points, the margins closely rolled back. Flower-heads small and numerous in a long loose, terminal panicle. Involucres cylindrical, often curved, not 2 lines long, straw coloured, white or brown, the bracts very thin, smooth and shining. Florets two, three, or rarely four.

A native of Victoria, New South Wales, South and Western Australia. It should be dug up before flowering, and burned.

Proclaimed for the Shire of Waranga, June 1894.

GRANT TO AGRICULTURAL SOCIETIES.

The following circular letter has been forwarded to the various Agricultural Societies throughout the State :—

Department of Agriculture,
Melbourne, 20th July, 1907.

CONDITIONS *re* GOVERNMENT GRANT TO AGRICULTURAL SOCIETIES.

SIR,—

Adverting to previous communications on the above subject, and to the circular of 1st March, 1907, setting out the conditions to be complied with, I have the honour to inform you that it has been decided to modify the conditions in the direction of making all four optional; that is, none of the conditions are to be compulsory, but any three of the four set out may be selected. Also, concerning Condition A (Examination for Soundness in Horses), it has been decided to modify the method of examination so as to allow of the examination being made concurrently with the judging of the classes, so that the condition will now read as follows :—

ii. METHOD OF EXAMINATION.—The veterinary officer to be in the judging ring at the time of judging, and to act with the judge so far as the determination of the question of soundness or otherwise of any exhibit is concerned, and to make, and be given facilities for making, such examination of any exhibit as he deems necessary to arrive at such determination. The decision of the veterinary officer on the matter of the soundness of any exhibit shall be final, and no exhibit deemed by him to be unsound shall be awarded a prize.

I shall be glad if your Society will take this modification of the conditions into consideration at an early date, and let me know which three of the four options are chosen. Of course it is now competent for you to alter any previous choice made if you so desire.

I have the honour to be, &c.,

E. G. DUFFUS,
Secretary for Agriculture.

The Secretary, Agricultural Society,

PLATE 15

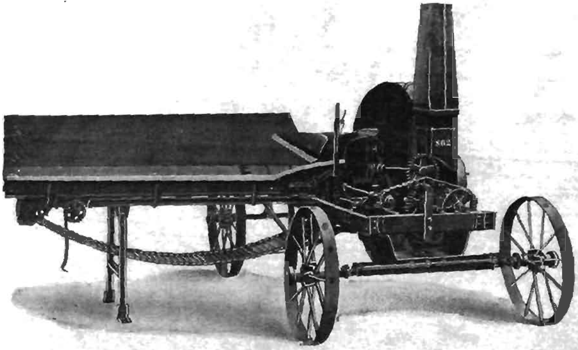
CHINESE SCRUB

(Cassinia arcuata, Rob Brown)

SILOS AND SILAGE.

A. S. Kenyon, C.E., Engineer for Agriculture.

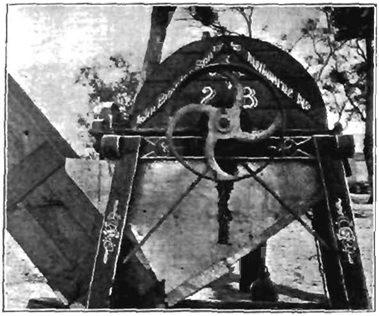
In the *Journal* for December last were printed the personal experiences of several farmers in the making and use of silage. Since then much more testimony has been received, and as the season for making spring ensilage is approaching, the present is a suitable occasion to place extracts from those letters before the farming community. That they do not all sing praises, and that most point out room for improvement, merely confirms what has already been noted that in silage making there is still a deal to be learnt. The conditions for its successful manufacture vary with the climatic conditions and the locality. Fodder cut too green becomes at times slimy; cut too late, there is a tendency to mould. Still the use of silage is fast on the increase. The additional sums provided last year by the Honorable the Treasurer for the assistance of farmers in the erection of silos have been all expended. It is proposed to allot the sum of £2,000 for the present year. Many applications for silos are already in.



CLIMAX ENSILAGE CUTTER AND BLOWER.

Last April, a trial of a new American silage cutter and blower was made. It is named the "Climax Ensilage Cutter and Blower." The cutting of the green stuff is done by blades with straight cutting edges. The blades are attached to a wheel similarly to those of an ordinary chaffcutter; the cutting edges are not radial, but inclined forwards. The effect is to give a chopping action instead of the draw-knife motion of the chaffcutter. Other American makes of silage cutters have spirally curved cutting blades revolving round a spindle much after the style of a lawn mower. Neither sort is capable of producing a decent sample of chaff, however efficient they may be at cutting green stuff. In the "Climax" cutter, the fans of the blower are attached to the cutting

wheel on the opposite side to the blades, and the whole is cased in. In the other makes, the blower is separate. The trial which was held at the farm of Mr. F. Wimpole, Preston, showed the advantages as well as demonstrating some of the drawbacks of the machine. It cut green maize well and quickly up to the rate of 20 tons per hour, and elevated it without trouble into the silo. It took approximately 10 horse power to run it, the greater part of the power being needed for the blower. Considerable strength, beyond that of the ordinary farmer, is required to cut, cart in, and feed as much fodder as the machine can handle. It is not, in short, suitable for the average farmer, though well adapted for a large one or for cutting by contract with a complete travelling plant, engine, waggons and teams. Messrs. H. V. McKay & Co., the local agents for the "Climax Cutter," are experimenting in the construction of a machine which will cut both chaff and silage, and blow up the cut stuff. It will cut about 4 tons per hour and should be driven by the ordinary motive power at a farmer's disposal. It is understood also that the



CHAFFCUTTER FITTED TO CHAIN ELEVATOR.

"Ohio Cutter" representatives, Messrs. Welch, Perrin & Co., are getting out a small sized cutter and blower which will be free to a great extent from the objections to the larger sized machines. Meanwhile it is well to know that the chain and slat elevator is effective; is cheap; and requires but little power to drive it. The method of connecting it to the chaffcutter is simple and easily contrived. The accompanying illustration gives a good idea of how to do it.

What is probably a record in silage for Australia, if not for the world, has been experienced at Euronyhareenyha Station, near Wagga. This station is owned by the Australian Mortgage, Land and Finance Co., and during the past three months 19,000 sheep and 400 head of cattle have been fed almost entirely on silage. During the past four good seasons, reserves of silage were accumulated on the station, and when the drought set in at the end of last summer a quantity of 3,000 tons was available. The silage was made chiefly from the mixture of barley, grass and lucerne, which forms the first growth each season on the irri-

gated paddocks. Various methods were adopted for preserving the silage. A 500 ton silo was built, on the plan introduced by Dr. Cherry, and filled with the above materials after they had been passed through a chaffcutter. Pits were scooped out of a sandhill, and stacks of silage were built, with and without additional weighting. As a result of the feeding, not only has the station maintained all its own live stock through the drought, but 5,000 sheep from another property have been drafted to it. The condition of the stock has been well maintained, and lambing is progressing with satisfactory results. The average cost of making the silage was about 5s. per ton, and, allowing a similar amount for the cost of feeding it to the sheep, the total expense works out at less than 6d. per month per sheep. If this silage had not been available it would have been necessary to have trucked nearly all the stock for at least 200 miles to get it out of the drought area. Recent rain has started the grass, which is now assured for this season. Dr. Cherry is satisfied that in another year considerable improvement may be made in the quality of the silage. So far the sheep have not eaten it so well as the cattle, but the success of this year's work shows the possibilities of future developments along similar lines. It is probable that the peculiar nature of the silage was due to its being made at a time when the barley grass which forms a great part of its bulk was in a green and very watery condition. This accords with similar experience elsewhere. The success of the experiment may, however, be measured by the fact that through its aid, according to the General Manager of the Company, in Melbourne, an outlay of £10,000 was saved.

The results of silage making at the Government Farm, Wyuna, are detailed in another part of this issue.

Mr. J. Briggs, Cudgewa, built his silo himself. He writes:—

I built my silo, and it is a great success. I put in about 40 tons chaffed maize and it is in splendid order, no waste at all, being sound and sweet right up to the iron. I made an improvement on the tinsmith's rivets. I found it very difficult to make a close joint, so in the last two rows of horizontal joints, I filled in between the studs with short pieces of 4 x 2, well fitted and nailed, and those two joints will never leak as I nailed them with the clout nails and made a splendid job of it. This is where the value of my innovation comes in. The silage below the three bottom rows of iron is all perfectly sound right up to the iron, while all above that was mouldy five or six inches in. It must be obvious to the most casual observer, that a solid nailed joint must be much more sure of being air-tight than any tinsmith's rivets could make it, and, whatever silos I may build in the future will be built that way. The studding presented a wider space outside than in. I dressed the corners off with a sharp tomahawk, and thus got the struts in fair and square, and they also brace the whole structure and make it very firm.

Although it appears from this that the present system of making the horizontal joints of the iron is not perfect, yet the many examples of successful silage with joints made in the usual way with rivets tell a contrary tale. It is intended, however, to put the hoops opposite the horizontal joints of the iron inside instead of outside the studs as usual, and to nail the joints to the hoops. With such an arrangement any doubt as to the air-tightness of the joints ought to disappear. The extra cost will be trifling.

Mr. J. F. Reedy, Dandenong, has an experience which is against a suggestion formerly put forward that the sun's heat affected the silage through the iron walls. He writes:—

We have got on very well with our silage. We are feeding 28 cows twice a day and they do well on it, both as a warm feed and for milking. We had

about 60 tons of silage made from green oats. But one thing I cannot understand is this: about three inches all round the outside of silage were no good being black and useless. The silage was trampled tightly in the making and it did not fall away from the sides after being finished. The silo is lined out with sheet iron and weather-boarded outside and has a good roof on it. The only thing that I can account for damaged silage is that some of it was a bit rusty when put in silo.

Mr. A. Brebner, Newstead, goes into practical and valuable details:—

After the silo was erected, I set a No. 2 Buncle chaffcutter and horse-works at it and commenced filling it about the middle of October, 1906, with a crop of rape in flower and seed, from 4 feet 6 inches to 7 feet high. To every three small loads of rape I put in one of Cape barley out in ear. This took up about 4 to 5 feet, well trampled by foot between each load. Then followed a couple of loads of each of the following alternately; a mixture of spear grass, trefoil, and lucerne, thousand headed kale, marsh mallows, and thistles (both sow and variegated). After that, I put in wheat with a good deal of undergrowth, followed by 3 acres of Algerian oats in the milky stage. As it was getting somewhat dry towards the end, I occasionally put in a bucketful of water, finishing up with a load of old straw made very wet, chaffed, and then again watered well, trampled solidly and about 4 tons of cord wood packed on top. I had a pipe inserted whilst filling and kept the temperature about 95 to 105 degrees from 2 to 3 feet from the surface, cutting and filling when the temperature got up to the 100 degrees and letting it stand when it went down below 90 degrees. After being weighted the glass stood at 122 degrees for three weeks, then gradually receded to 106 degrees when it was opened on the 9th of January of this year. It had sunk 22 inches only, and the coat of wet straw chaff had formed a mould which appeared to be practically air proof, for there was not ½ an inch of waste between the two, and only an occasional patch of mould now and then near the iron, the bulk being good right up to the wall. I have not yet got through the oats, although feeding 9 cows, 4 calves and 4 horses, the latter get a bucketful each per day. Of course they also have the run of the paddock, which does not contain much nourishing feed now (February). Six of the above are milking cows.

As to the cost of filling, it is only a rough estimate, as I cut a good deal with the scythe in out of the way corners; getting to the paddock I used a mower and horse rake. It was cut one day and chaffed the next. One horse carted, and another worked the cutter and elevator at short spells. The silage was well trampled between each load, especially the outside edge, which was kept about 1 foot higher than the centre. Roughly speaking, I consider the cost of filling at 6s. per ton, apart from the cost of crop. Through the lower 10 feet, I spread 1 cwt. of fine salt, a layer now and then, but cannot judge of the benefits or otherwise for a time, not having reached it yet. I consider that one cannot trample it too much whilst filling, so as to press out the air as soon as possible. It is turning out good quality and it is not an easy matter to keep the cattle away from the silo. I am feeding at the rate of 40 lbs. per day to a full grown beast.

After Mr. Brebner's experience, there should be no hesitation in putting almost any kind of crop into the silo. It should be noted that his cost for filling includes that of harvesting.

Mr F. C. Curlewis, Rutherglen, is not perfectly satisfied but is observing closely with a view to improvement:—

I have the silo about half emptied. The barley part of my ensilage is not as satisfactory in appearance, etc., as the white oats part; it is drier and much more liable to mould and has retained its heat right through, whereas any separate patches of white oats are quite cool and much greener and sweeter. The cows eat it all very greedily, but during January and February they did not do so well as one was led to expect by the reports. Our dairy herd is not yet a representative one as we only started milking last May and in this, a non-dairying district, it is not easy to pick up good cows and as most of the heifers were young or else calved during April or May, we cannot really judge of the merits or demerits of the cows or of the ensilage. There is no question, however, that compared with other suppliers to our creamery, our returns have gone down very little and less so since we have fed on bran and reduced the ration of ensilage 15 to 20 lbs. per cow to 5 to 10 lbs. according as the cow is freshly in or not.

Mr. T. R. Nicholls, Drummartin, is not a dairy farmer. His experience with the sheep confirms the fact that for sheep, silage has to be made both well and from good fodder.

We opened the silo the second week in March and have been using it continuously ever since. The first two weeks we fed 16 bullocks. I then sold them and started to feed 160 ewes and 6 head of cattle, and have fed them daily ever since. The cattle had a small dray load of damaged stuff daily, and the sheep a somewhat larger quantity of the best ensilage. The cattle ate it well from the start, but there was a good deal of waste on account of its being damaged. The cattle kept their condition fairly well. The three cows we were milking got hay chaff twice daily in addition. The ensilage did not appear to make much difference in the yield of milk, but kept them in good health, being fine in their skins.

We had more difficulty with the sheep; for the first week they ate very little. We laid it on the ground in rows, but they ran over it and destroyed the greater part. We then got some iron troughs and got on much better feeding them then. Sheep like it well cut. We had ours cut with an ensilage cutter, and it was cut long. The sheep would pick out the fine and the long stuff we used to take home for the cattle. Another year we will cut it with a chaffcutter.

We found a good deal of waste in the silo. I should say one-third was damaged, on an average 1 foot to 15 inches around the outside was very inferior, and there were patches further in apparently mildewed. We had a man in the silo whilst filling. I think he did not trample it evenly. After every load was out, three or four men would go in and trample it mostly on the outside, which I now think was not a good thing. What is wanted is an even pressure all over it. Next time when filling, I will have a shoot to run the ensilage into the centre of the silo, and after every load is cut, go in and trample it evenly all over. I find in making ensilage or hay, the better the quality of the material the better the ensilage or hay. A neighbour helped us when filling the silo, and then we helped him fill his silo. The material we used was wild oats, with a mixture of wheat about 5 feet long. The wild oats were a bit on the dry side. My neighbour's was Algerian oats about 3 feet high and fairly green. His sheep were very fond of it, and would run to meet the dray when they were bringing it out. He fed it on the ground to them and had very little waste. In the silo the damage was much the same as in ours. I hope, next year, with the experience we have gained this time to turn out a better article.

My neighbour had an unfortunate experience of spontaneous combustion with his *stack* ensilage. Here is his account:—The crop cut for ensilage was self sown wild oats; 27 acres were cut with a mower and carted and stacked while being cut. The crop was out in ear and beginning to turn in colour. Twelve winding drums with ratchets and levers were used, six on each side of the stack. There were six heavy logs put underneath the stack and the drums were bolted down to the ends of the logs. The six cables were made from three fencing wires (No. 8) twisted together and put over the stack and fastened to the drums. The drums were then turned with the levers (both on the same cable on each side of the stack at one time) until very tight, and levers were shifted to the next two drums until all were tightened. The stack was pulled down every day for a while, and then every few days, then every week or so. It had not been pulled down about a month before the fire, and as the stack had been built over three months, we considered it would be set. Fifteen days after the fire there was a big heap of stuff just smouldering away in flakes. A few days after the fire we removed 3 feet off part of the top to see if there was any of it not burned but the fire had apparently got through it all, as it was all black and smoking. We had to water it well to be able to stand on the stack to take any off. The fire was blazing at 6.30 in the morning before any one noticed it. There must have been many tons weight on the stack as we broke two of the cables pulling it down and it was good wire.

This is an unusual occurrence and speaks in favour of weighting which gives a continuous pressure.

Messrs. Swan & Sons, Londrigan, write:—

Although all grass has dried up our cows are keeping up well on the ensilage and are also in splendid condition. The top part of the silo was rather unsatisfactory but we think this was due to using it too soon, and not using enough at each feeding, owing to maize and other green feed being plentiful. There is

also a good deal of waste round the outside, but nowhere else. We are feeding about 30 lbs. to each cow with about 3 lbs. of bran, and the cows never looked better. We are milking 25, and 13 of these are heifers. At present we are getting 41 gallons of milk per day with a 4.3 test.

There are no mouldy patches. We think we made a mistake in using it too soon after filling especially as we had plenty of green maize and a good paddock of lucerne. On the whole we are well satisfied and shall fill the silo next season taking care to finish off on top more carefully than we did this season. We kept four men constantly trampling the ensilage during the filling of the silo and frequently had seven or eight trampling at intervals, but we made the common mistake of not keeping the sides higher than the middle. We did not put any weight on top, or seal in any way, but started using immediately after filling. The waste occurred we think through not using it in sufficient quantities, thereby having too much surface exposed to the air for too long a time.

Mr. Henry Foster, Whitfield Estate, says:—

I filled my silo three parts full of maize and broom corn—all it was possible to get in as it was getting too dry. I lost about 18 inches all round the walls, and a little through the bulk, but, on the whole I was very pleased with the result. The cows got quite fond of it, and in the spring came in quite fat, and had no leeway to make up when they calved and started milking. I am just on the point of again filling my silo with maize and broom corn.

The broom corn referred to is the stalks left after cutting for the market. Owing to its woody nature, it is of very little use if left in the field for the cows to eat, but made into ensilage it is fairly good feed becoming soft and succulent.

Mr. H. Jacob, Mildura, writes at some length, but to great benefit. The following is extracted from his letters, one in March and the other in May:—

I have had the floor of the silo cemented, as before it was only covered with bags; I now hope to have the silage good right to the bottom. The bag chute previously mentioned is now working, and I find it quite satisfactory. It saves moving the stuff as I can guide the chute to any part. Also I believe it will make better silage as it is evenly mixed and sets firmer; before, the leaves or flag being all together were spongy. I am keeping it well trodden especially around the sides. The maize is at its best, being well cobbed, and just beginning to get hard, but the stalk and leaves are green. I am filling at the rate of 5 tons a day so it will take me a fortnight to complete. No extra help is employed so we are only able to put in five hours a day at one ton per hour. There are three working at it, one carting, one cutting, and one chaffing. The extra cost, charging the ruling rate of wage at 8d. per hour, is 2s. per ton, so £6 for filling a 60-ton silo is not very expensive.

The silo is serving its purpose as a guide to others, as another dairyman has one erected. He came here for particulars, but he seemed to think it could be built much cheaper, so he has had one built partly on his idea and partly on this one. The changes he made I do not agree with. They are as follow:—Only three wooden bands 6 feet apart, using fencing wire between. The 6-feet sheets of iron standing upright around the sides. No foundation posts, but a round trench dug in which he places the uprights, which are of redgum, and without bands to hold them in place. . . . .

I had 54 tons when finished, but now I have reduced it by 6 feet. I find hardly any waste around the sides, the average being only 3 or 4 inches, and, about half way round good right up to the iron. The good quality and the small waste I put down to using the chute and ramming the sides. I used an old cog wheel 1 foot in diameter with a stick in centre for handle and after treading well I found with ramming that I could force it down 6 inches or more. Also the chute lets the stuff fall without dividing, the grain, stalk, leaves, and small chaff falling together fit closer, thereby excluding the air. Further it saves levelling and makes better feed, as each cow gets her proper proportion of grain, leaves, &c. The sides of silo, I covered with a thick lime-wash. The joints in iron I made to all appearances, air-tight, by well smearing them, and as they face upwards, it is very easy to do. In your table of the different ages of maize, the older it gets, the better it is for ensilage. Would the extra

nourishment be produced by the ripe crop? If so I should like to know if we get the advantage of that. As I find the manure full of grains not digested, would it be better to cut it a little younger? I see no occasion for waste around the sides presuming they are air-tight.

I noticed in reading about silo filling, that it was done in a few days. The impression gained thereby was that if too long a time were taken over it, the stuff would spoil. I think I am the longest; from start to finish it took three weeks. Being shorthanded through illness, I lost over a week, three days being the longest period of not cutting. But I find no trace of any difference in silage, as I have passed the place where stoppage occurred. I started to feed as soon as silo was finished, so did not cover or have any waste on top. Lucerne hay and maize ensilage make an ideal feed for dairy cows. I have cows milking up to 16 and 18 quarts a day with no other feed. The silo I look upon the same for preserving green feed as the hay stack for dry, and it would be just as reasonable to leave our hay exposed to the weather and cut it when wanted as to leave the maize growing until required.

I think I mentioned before that it cost me 2s. a ton to fill the silo. I thought some might think it was a misrepresentation on my part. The facts are as follow: The distance to haul was about 200 yards, and the crop was heavy, standing from 9 to 10 feet, some 12 feet. (These are some of the advantages of irrigation and small areas.) One person cut and placed in heaps of about ½ cwt. each, whilst another carted. We use a trolly bed, 18 inches off the ground, so one person can put on the whole load (10 cwt.) without any help. At the chaffcutter I have a table 8 feet by 6 feet, level with the feed-box. On this the carter places the whole load at once, with the butts towards me, so that I can cut up the whole 10 cwt. without moving from my place. They were able to keep me well supplied and it worked very well; I did not have one stoppage for want of feed. The horses work by themselves. As I am close by, any attention they want, I am able to see to at once. As we cut 1 ton an hour, three persons employed at 6s. a day, or 8d. an hour, makes the 2s. per ton. The actual cash cost to me comes out at 6d. per ton. One boy receives £1 a week and keep, and the other 10s. Many farmers having sons are quite able to do the same, so there is no occasion to fear that the expense of filling a silo with chaffed maize is too expensive. When mentioning the 6d. per ton, no allowance is made for my own services. I think your Department has done a good work in bringing the matter well before the farmers, and with the experiences collected and published, will be quite sufficient to dispel any doubt which any one may have in regard to the advantage of having a silo.

Mr. W. J. Chinn, Rural View, Clydebank, writes:—

As a fodder I must say that I like ensilage very well, but at the same time there is far too much waste with the mouldy patches. In my silo there is always a waste of about 3 to 4 inches all round the sides, really rotten wet stuff. The mouldy patches I work in with the good, so that it is not altogether waste. At the present time I am feeding on ensilage made of oats with a little hay chaff mixed with it. I give each cow one milk-dishful night and morning with about 1 pint of bran mixed with each feed; 28 cows fed thus give from 44 to 48 gallons of milk daily.

Mr. John F. Fortune, Yundool, says:—

I have not yet started feeding ensilage, but shall do so about the middle of this month. I had the following in for green feed:—Japanese millet, 4; Amber cane, 17; Planter's Friend, 9; Teosinte, 10; Cow peas, 15; and pumpkins, 2 acres; total, 57 acres. As the cows will go direct from grazing on cow peas to ensilage I cannot anticipate an increase in yields, rather the reverse, I fancy, as for the last three years, cow peas have proved the best milk and butter-fat producers of all the green fodders, but the silage will doubtless maintain the supply for a prolonged period.

Mr. Fortune is about to erect another silo as he finds is indispensable for the profitable working of his herd.

Mr. James Bennett, Warracknabeal, writes:—

We opened our silo on the first of March and have found it in a very satisfactory state. There are about 4 inches of waste under the sand and a little around the edge of the iron for about a foot down. I am feeding to dry cattle

once a day and two milch cows twice a day, about one kerosene tin at a feed. The cows have the run of a stubble paddock and so far are keeping up their milk which I was not able to do last year on the irrigated green stuff.

Mr. James Baker, Gheringhap, adds to his previous report:—

I have been waiting to see if the sheep would take to it, which I am glad to say they have done, and I hope to be able to speak well of it for feeding sheep later on. I have got a nice crop of maize coming on to refill the silo. Feeding results:—I have been giving about 25 lbs. of barley silage to steers 2½ years old to keep them in good condition which it is doing well. Loss through damaged sides:—On an average about 6 inches, being mostly at the joints, and in places good to the side in the centre of sheet. All the rest is coming out in good condition, no mouldy patches. The crop of barley was very coarse, 4 acres filling the silo, 15 feet by 21 feet, which settled 4 feet before being opened. As far as my experience goes more care is needed to make silo airtight than for maize, and I am going to put in more rivets before filling again.

The settlement in this case was too great, more trampling while filling is advisable.

Mr. J. L. Todd, Bulleen Road, writes:—

I started feeding it to about 50 cows on the 2nd December and fed two big bucketfuls to each cow every day. It lasted till the 9th March. I always had from 48 to 52 cows feeding on it, so consider it lasted marvellously well. This was no doubt due to it having been so well trampled. There was practically no loss except at the bottom where there were about two bags of a mouldy patch. When the silo was filled no weights were placed on the top of the silage at all. The excellent condition, which was uniform throughout, was due I think to the great amount of trampling which Mr. Connor of your Department insisted on having done. Although filling the silo seems to be a great labour at the time, I consider it a lot less labour than having to stook your hay, then stack it, and finally to cut it into chaff before you can feed it to your cows, and it also saves the cost of bags. Of course it is needless to say the cows were exceedingly fond of it. The thing that struck me most about the silage was the length of time it lasted.

Mr. John R. Orr, Murchison, writes:—

We filled the silo with dirty oats, &c., chaffed up, and finished filling about 14th November. About 1 foot of earth was put on top for weight. It was opened about the 6th of February. Under the dirt, about 1 inch of silage in the centre, and around the outsides about 1 foot, was rotten till it got down about 3 feet. Then there is about 1 inch all round the walls that has never turned into silage, being quite green, and 4 or 5 inches in from that again are musty (it is emptied down 7 feet from top). The cows have eaten the silage well, including the bad and rotten stuff, it being all cleaned up. About twenty cows have been fed on it at the rate of about 20 lbs. a cow per day for about a fortnight. Since then we have been feeding on green maize and sorghum. These will be done in about two or three weeks, when we will go back to the silage. There is more butter per week from the silage than there is from the maize and sorghum. I think the wall of the silo is not thick enough, it will not hold the heat in long enough to turn the stuff around the sides into silage. Have there been any silos built yet with a double wall and filled up between the two walls with charcoal or sawdust, or some other material that will not rot the timber in the walls?

The thickness of the wall has nothing to do with the matter. The bright green colour is due to the chemical effect of the lime wash while the damaged stuff inside that is due to air escaping as the silage settles. Well trampling and well weighting will reduce this to a minimum. It is not, however, waste as if not in great quantity it is as readily eaten by the cows as the rest of the silage.

Messrs. Gray Bros., Wedderburn, say:—

We started filling silo on 23rd October, with 12 acres of crop, half wild oats and half wheat, oats well out in ear, and wheat budding—no dry flag. We completed filling on the 27th. The crop was cut into chaff with steam cutter, ordinary length, and elevated with chain elevator. The cost of cutting, carting, chaffing,

and 5 per cent. on cost of 65 tons silo was 4s. 3d. per ton. One man was continually in the silo during filling, and sometimes three or four for one hour. We filled at the rate of 6 feet per day. Trampled round the sides well on finishing and sprinkled 15 gallons of water over silage, which was covered with old bags, and 8 inches of pulverized loam. The silo was opened on 23rd March. There was a layer of mould 6 inches in centre to 10 inches at sides, and a layer of mould around sides 15 inches thick. Have been feeding to lambing ewes at rate of 2 lbs. per head, and after a day or so, they seemed to do well on it. Whilst regretting the waste round the sides, we are, on the whole, convinced of the advantages of silage for this district.

A later letter states:—

There are now 7 feet of silage in the silo, and the mould round the edges of the silo has reduced to 4 inches, and in parts only of the outer edge of the silage is any mould to be found.

Mr. J. M. B. Connor, Dairy Supervisor, reports having visited Tatura on 17th April to open the silo erected under this Department's supervision at the farm of Mr. Henry Lockwood of Harston.

The crop grown consisted of 4 acres of maize; 2 acres were manured at the rate of twenty loads of farm-yard manure to the acre, the balance of the land receiving no manure. Where the land was manured the crop grew 3 feet higher and yielded about 3 tons more fodder to the acre. Fifty tons were taken off the 4 acres, and filled the silo in within 4 feet of the top. The crop from appearance was cut slightly on the ripe side, but as there was plenty of water used, the silage turned out a splendid sample, with practically no waste on the top surface, the top being covered with a layer of saturated old chaff, which was then covered with a foot of sand. During the filling the fodder was well trampled and about 1 cwt. of salt spread. The silage is being fed to 30 cows, which are very fond of it.

Mr. George Sloss, Bacchus Marsh, writes:—

I put one up on the plan you laid down in the *Year Book of Agriculture* for 1905. Mr. Kenyon was up and gave me a few hints, and, when I was ready to fill it, Mr. Connor came and lent a hand for the first day. Both his and Mr. Kenyon's services were very acceptable. Unfortunately I did not have enough maize to fill the silo. When it was all in, it was not 8 feet high. However, it did not settle down much, and for the last four or five weeks I have been feeding 22 cows on it, twice a day. The cows say it is good, being very fond of it, leaving none their tongue can reach, and with the help of the ensilage and the nice green grass, they have nearly doubled their milk supply.

Farmers desirous of having silos erected upon the departmental terms must apply in accordance with the following form, copies of which can be obtained on application.

APPLICATION FOR THE CONSTRUCTION OF A SILO.

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The Secretary for Agriculture,
Melbourne.

I hereby apply for the construction of a Silo and of an Elevator to fill same, and I hereby agree to comply with the conditions set forth hereunder.

Signature.

Name of applicant in full—
Name of parish and No. of allotment—
Postal address—
Nearest railway station—
Capacity of silo required—
No. of Stock to which silage is to be fed. Cows— Sheep—
Crops proposed to be grown for silage— No. of acres—
Make and No. of chaffcutter— Diameter of cutter spindle—
Or particulars of proposed filling arrangements—
Proposed method of payment—In full on completion of silo or in three equal annual instalments secured by promissory notes—

CONDITIONS.

The applicant must either pay in full the amount claimed by the Department of Agriculture as the cost of supplying and erecting the silo upon presentation of

the account, or he must give three promissory notes, each for one-third of such amount, the first payable on the 1st of June next after completion of silo and the *second and third payable on each following 1st of June respectively.*

The applicant must cart the silo material—weight about 3 tons for standard 60-ton size—from the nearest railway station to the site; must meet the Builder when advised, convey him to the work, board and lodge him and provide him with the necessary assistance (three men) while building—four to five days.

The green fodder must be chaffed and the silo filled and weighted under the supervision of an officer of the Department, or in accordance with instructions issued by the Department. Full records must be kept of the results obtained from feeding the silage and a report made to the Department.

DETAILS OF DIMENSIONS, CAPACITY, AND MATERIALS REQUIRED.

Length of Trammel.	Inside Diameter.	Height.	Capacity.	Studs.	Battens for Hoops.	Iron.	Approx. Weight. 6 x 3 x 24g. Black.	6 x 3 x 24g. Galvd.
	Ft. In.	Ft.	Tons.			Sheets.	T. C. Lbs.	T. C. Qrs.
		21	45	...	66 17 ft. 6 x ½	49	0 7 0	0 8 3
6 9	12 10	24	56	29	69 ,, ,,	56	0 8 0	0 10 0
		30	80	...	81 ,, ,,	70	0 10 0	0 12 2
		21	60	...	63 18 ft. 6 x ½	56	0 8 0	0 10 0
7 8	14 8	24	73	33	69 ,, ,,	64	0 9 16	0 11 2
		30	100	...	81 ,, ,,	80	0 11 44	0 12 1
		21	76	...	83 17 ft. 6 x ¼	63	0 9 0	0 11 1
8 7	16 6	24	94	37	91 ,, ,,	72	0 10 32	0 12 3
		30	130	...	107 ,, ,,	90	0 13 0	0 16 1

NOTES.

The ordinary horseworks and chaffcutter are suitable for cutting and filling silage.

The silo should be well white-washed inside with a thick wash made of lime and skim milk. This can be done each evening after filling, the silage serving as a scaffold.

The crop should not be cut until it has reached the proper stage of maturity.

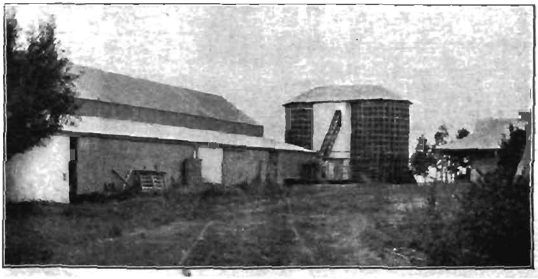
Trample the silage as much as possible, especially round the sides, keeping the centre high.

Fill in not less than 5 feet and as much as 12 feet per day

When filled, put on a 12-inch layer of chaffed straw well wetted, and load over whole surface with 3 to 5 tons of earth, stones, or other convenient material.

It is better to chaff the green stuff on the day that it is cut.

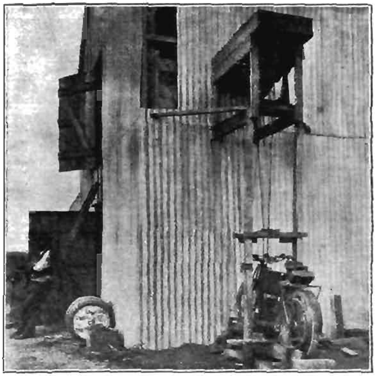
Keep the bottom hoop clear of earth and rubbish.



CHEAP MOTOR POWER ON THE FARM.

J. M. B. Connor, Dairy Supervisor.

When inspecting the dairy farm owned by Mr. W. J. McVeigh at Craigieburn I was greatly taken with the novel and ingenious method adopted for working the chaffcutter. The arrangement is Mr. McVeigh's own idea, and the work of erection has been planned and carried out by him. It consists of a motor-bicycle, $2\frac{3}{4}$ H.P., driving a two-bladed chaffcutter, with a 9-in. mouth, which cuts for a herd of 30 cows, and something additional for neighbours' requirements. From the motor, an ordinary separator cable drives on to a separator intermediate wheel, two feet in diameter, from which a 12-in. pulley drives on to a pulley of



similar size on the chaffcutter. The motor is kept cool, by the ingenious fixing of a pair of 12-in. fans, driven at an angle of 45 degrees, with a flexible shaft at a speed of 1,500 revolutions per minute, which keeps the motor cooler than during the ordinary use on the road. The motor is fixed in a convenient stand from which it can be dismantled and made ready for road use in a couple of minutes.

Chaff is cut at the rate of 15 cwt. per hour at a cost of 9d. per ton. On my arrival at the farm Mr. McVeigh had just finished cutting 30 bags of chaff for one of his neighbours, so I had an opportunity of seeing everything going at full speed; about an hour afterwards I noticed him riding the motor along the Sydney-road at the rate of about fifteen miles an hour. The illustration attached is from a photograph taken at the time, and will convey some idea of the fixing of the mechanism.

STATISTICS.

Rainfall in Victoria.

SECOND QUARTER, 1907.

TABLE *showing average amount of rainfall in each of the 26 Basins or Regions constituting the State of Victoria for each month and the quarter, with corresponding monthly and quarterly averages for each Basin deduced from all available records to date.*

Basin.	April.		May.		June.		Total for Second Quarter.	Average for Second Quarter.
	Amount, 1907.	Average.	Amount, 1907.	Average.	Amount, 1907.*	Average.	*	
Glenelg and Wannon Rivers	3.96	2.33	2.69	2.56	1.40	3.64	8.05	8.53
Fitzroy, Eumerella, and Merri Rivers	4.52	2.52	2.97	3.13	1.79	3.86	9.28	9.51
Hopkins River and Mount Emu Creek	3.30	2.37	2.65	2.45	1.32	3.23	7.27	8.05
Mount Elephant and Lake Corangamite	3.27	2.19	2.07	2.33	0.86	2.95	6.20	7.47
Otway Forest	3.96	3.64	3.36	4.51	1.39	5.09	8.71	13.24
Moorabool and Barwon Rivers	3.52	2.35	2.02	2.55	1.27	2.85	6.81	7.75
Worribee and Saltwater Rivers	2.73	2.41	1.12	2.56	1.71	3.05	5.56	8.02
Yarra River and Dandenong Creek	4.23	3.15	2.17	3.33	1.47	3.67	7.87	10.15
Koo-wee-rup Swamp ...	4.20	3.41	2.18	3.73	1.09	3.81	7.47	10.95
South Gippsland	6.58	3.61	1.71	3.71	1.21	4.56	9.50	11.88
Latrobe and Thomson Rivers	4.94	3.24	2.05	3.49	1.32	3.69	8.31	10.42
Macallister and Avon Rivers	1.97	2.86	0.63	2.10	2.38	2.46	4.98	7.42
Mitchell River	1.95	3.34	0.89	3.14	3.51	2.61	6.35	9.09
Tambo and Nicholson Rivers	1.53	3.01	1.02	2.70	3.19	2.71	5.74	8.42
Snowy River	2.15	4.04	2.27	3.14	3.64	4.45	8.06	11.63
Murray River	1.20	1.80	1.03	1.95	1.75	3.20	3.98	6.95
Mitta Mitta and Kiewa Rivers	1.98	2.38	1.90	3.13	2.40	5.29	6.28	10.80
Ovens River	2.58	3.04	2.48	3.54	3.75	6.36	8.81	12.93
Goulburn River	2.42	2.05	1.45	2.41	1.61	4.00	5.48	8.46
Campaspe River	3.05	2.12	0.81	2.66	1.21	3.69	5.07	8.47
Loddon River	2.13	1.73	0.98	1.87	1.37	2.78	4.48	6.38
Avon and Richardson Rivers	1.55	1.53	1.57	1.53	1.05	2.30	4.17	5.36
Avoca River	1.63	1.69	1.20	1.67	1.24	2.74	4.07	6.10
Western Wimmera	3.56	1.86	2.61	1.88	1.29	2.82	7.46	6.56
Eastern Wimmera	2.30	2.06	2.60	2.14	1.34	3.34	6.24	7.54
Mallee Country	1.39	1.27	1.31	1.22	1.08	2.37	3.78	4.86
The whole State	2.59	2.26	1.76	2.35	1.70	3.39	6.05	8.00

* Figures in these columns are subject to alterations when the complete number of returns for June has been received.

P. BARACCHI,
Government Astronomer.

Perishable and Frozen Produce.

QUARTERS ENDED 30TH JUNE, 1907 AND 1906.

Description of Produce.	Exports from the State.		Deliveries from the Government Cool Stores.	
	1907.	1906.	1907.	1906
Butter ... ... lbs.	2,771,296	4,349,644	911,568	1,702,064
Cheese ... ... "	249,601	376,360	111,489	46,731
Ham and Bacon ... "	928,800	531,800	...	...
Milk and Cream .. cases	7,161	3,616	180	7
Poultry ... ... head	15,870	15,400	2,438	1,823
Eggs... ... ... dozen	9,156	7,830	45,549	38,372
Mutton and Lamb carcasses	30,914	20,840	9,221	851
Beef ... ... quarters	410	888	...	...
Veal ... ... carcasses	2,899	1,920	213	...
Pork... ... ... "	462	1,272	122	561
Rabbits and Hares ... pairs	600,864	1,846,644	402,972	845,874
Fruit ... ... cases	37,725	52,765	3,582	643
" Pulp ... ... "	654	491	..	...
Sundries ... ... lbs.	...	...	27,473	36,148

P. J. CARROLL,
Acting Superintendent of Exports.

Fruit, Plants, Bulbs, Grain, &c.

IMPORTS AND EXPORTS INSPECTED DURING QUARTER ENDED 30TH JUNE, 1907.

Goods.	Imports.		Exports.		*Goods.*	Imports.		Exports.	
	Inter-State.	Over-sea.	Inter-State.	Over-sea.		Inter-State.	Over-sea.	Inter-State.	Over-sea.
Apples ...	365	—	1,132	28,425	Barley ..	4,093	—	—	—
Bananas, b/s.	85,922	—	—	—	Grain ..	50	2	—	—
Bananas, c/s.	4,560	138	571	—	Maize ..	151	—	—	—
Grapes ...	9	—	627	—	Beans ..	342	36	—	—
Lemons ...	591	—	277	1,298	Nuts ..	—	1,088	—	—
Mixed fruit	564	—	123	1,806	Nutmegs	—	135	—	—
Oranges ...	44,230	21	442	813	Oats ..	2,832	50	—	—
Passion fruit	2,046	—	65	21	Peas ..	2,131	107	—	—
Peaches ...	—	—	279	21	Potatoes	47,210	—	—	—
Pears ...	119	—	690	2,491	Yams ...	28	188	—	—
Persimmons	26	—	6	—	Rice ..	—	62,732	—	—
Pineapples	7,552	5	114	105	Seeds ...	4,619	6,401	—	—
Quinces ..	—	—	125	—	Wheat ..	—	51	—	—
Tomatoes ...	7	—	26	—	Drd. fruits	—	7,453	—	62,061
Plants ...	405	135	23	344	Cnd. fruits	—	—	—	4,455
Bulbs ...	21	44	—	—	Jams, Sauce, etc.	—	—	—	1,066
Totals ...	146,417	343	4,500	35,324	Total ...	61,456	78,243	—	67,582

Total number inspected = 393,865 packages.

J. G. TURNER,
Inspector under the Commerce and Vegetation Diseases Acts.

THE ORCHARD.

James Lang, Harcourt.

Planting operations should be completed as early as possible this month, especially as the weather is unusually dry for the time of the year. If delayed too long the young trees will not get fairly established before the dry weather sets in, when they will make but weakly growth. Pruning also should be finished as soon as possible this month, otherwise if delayed until the sap begins to rise and the buds to swell the trees are weakened.

It will be necessary to use the spray pump in order to deal with mussel scale and red spider. The latter insect does far more injury to the tree than many orchardists suspect, and is far more prevalent than usual this season owing to the dry autumn and winter. It can be observed on the underside of the small branches and fruit spurs, appearing red like brick dust. Kerosene emulsion and red oil are about the best remedies to destroy it. The red oil should be made into an emulsion as follows:—Take an empty kerosene tin; put in a gallon of soft water and bring it to boil, dissolve 1 lb. soft soap in it, take the can off the fire and add 1 gallon red oil, place on the fire again, and stir continually until it just commences to boil. Then lift off the fire and work it through a small spray pump for a period of not less than three minutes and make up with cold water to 15 gallons. This spray can only be used in winter and should not on any account be used in spring or summer. It is also necessary that a complete emulsion should be formed, otherwise the free oil floats on top and comes through the spray pump at the last, with the result that it will most certainly kill tree and branch where it comes in contact.

Peach trees will require spraying for black aphis. The old remedy, tobacco and soft soap, is about the best to use. Put 1 lb. tobacco in a tub and pour four gallons of boiling water over it, cover it over and allow it to infuse for an hour or two. Then dissolve 2 lb. soft soap in 2 gallons of water, add this to the tobacco water, and make up the whole to 20 gallons of spray. Kerosene emulsion is also good for the peach aphis. Where the trees are badly affected with the aphis they should be sprayed every week to keep it well under.

Strawberry plantations may still be renewed; clear off all the runners in the old beds, and dig or plough between the rows. Raspberries and gooseberries may still be planted, but it is not advisable to plant too late. Old and worn out trees, provided the roots are healthy, can be renewed by cutting them well back; they will soon shoot again with renewed vigour. If the present varieties are not suitable for market requirements, the trees can be regrafted early next month with varieties better adapted to locality or market purposes.

THE JOURNAL

OF

The Department of Agriculture.

Vol. V. Part 9. 9th September, 1907.

LAMENESS IN HORSES.

(Continued from page 477.)

S. S. Cameron, M.R.C.V.S., Chief Veterinary Officer.

Blood Spavin.

This is a distension of the saphenic vein as it passes upwards under the skin at the front and towards the inside of the hock exactly over the seat of bog spavin. The distension may occur from the pressure of a bog spavin impeding the flow of blood up the vein, or when the vein is affected with varicosity; but either of these conditions is so extremely rare as to be considered a negligible quantity.

Some horses show a distension of the saphena vein in this region after exercise, but it is not accompanied by lameness or anything untoward, and soon passes off.

Bone Spavin.

The origin of the term "spavin" has been variously accounted for. Williams has it that it may have been derived from the Italian "spavenio"—a disease of horses; but he adds that this is an unsatisfactory explanation. To me the word is obviously derived from the Greek word *spasma*—a spasm, from Gr. *spaein*—to draw, to cause convulsion; therefore, any convulsive effort, involuntary contraction, or drawing up, such as occurs in the hind limb of a spavined horse during progression or when moved. This "clicking" action is a pronounced symptom, sufficiently striking as to warrant its being named when a one-word description of the disease was wanted.

Bone spavin is the most frequent and, by virtue of this and of its seriousness, the most important of the diseases of the hock. It consists of a bony deposition on and between the small bones of the hock—the cuneiform bones—situated at the inner and lower part of the joint towards the front. (See Figs. 85 and 86). The bony deposit may stand out from the natural surface to an observable degree, or it may exist between the separate bones, and cause union between them without any recognisable enlargement (occult spavin); or there may be both obvious enlargement

and union of the bones, this latter being the most frequent condition. The bony deposit or outgrowth is the result of inflammatory action in the bones or their covering, and, as with splints, the inflammation and lameness continue until the bones implicated are completely concreted or cemented together in one mass. This union of bones forming a joint is known as "anchylosis," and when it occurs in spavin the actual lameness usually ceases, but there remains a stiffness or want of freedom of hock action plainly palpable to the practised eye.

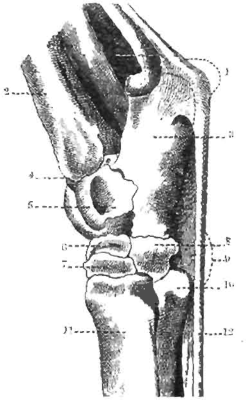


Fig. 85.—Hock, external aspect—1. Seat of "capped hock." 2. Tibia or leg bone. 3. Calcaneum or heel bone. 4. True hock joint. 5. Astragalus. 6. Large cuneiform bone. 7. Median cuneiform bone. 8. Cuboid bone. 9. Seat of "Curb." 10. Head of external splint bone. 11. Metatarsal or hind cannon bone. 12. Perforatus tendon. (After Hayes.)

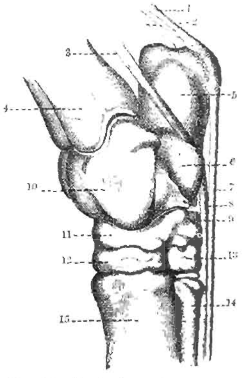


Fig. 86.—Hock, internal aspect—1 and 2. Tendo achilles (Perforatus tendon and gastrocnemius tendon). 3. Perforans tendon. 4. Tibia. 5 and 6. Calcaneum. 7. Perforatus tendon. 8. Perforans tendon. 9. Cuboid bone. 10. Astragalus. 11. Large cuneiform bone. 12. Median cuneiform bone. 13. Small cuneiform bone. 14. Head of internal splint bone. 15. Large metatarsal or hind cannon bone. (After Hayes.)

Spavin may develop at almost any age, but it is most common in immature or "growing" horses under six years; and in these, is a less serious affair. In aged horses with hardened bones a spavin takes a much longer time to "set," the accompanying lameness is much more persistent, and treatment is not likely to be so effective.

CAUSES.—Jar or concussion is usually considered to be the most important factor in the causation of spavin, but its effect in determining the incidence of the disease is not sufficiently clear to warrant dogmatic assertion on the point. It must, however, be conceded that, on account of the peculiar shape and disposition of the bones of the hock, the small bones at the seat of spavin are subjected to a vibratory jar, additional on that

experienced when the foot comes to the ground. Towards the termination of the act of bending the hock there is a noticeable "click" of the joint, the last part of the act being sudden and swift. While the first part of the flexion is directly due to muscular action, the latter part is mechanical, the impetus given by the muscular effort being, on account of

Fig. 87.—Bones of hock, front view. (After Hayes.)

Fig. 88. Bones of hock, back view. (After Hayes.)

the screw-like shape of the astragalus bone, continued until the joint is bent to its limit; in other words, the commencement of the movement is effected by muscular effort, and its completion is effected by momentum. The final jerk or click, so plainly observable in horses with extreme hock action, produces a vibratory jar on the small bones of the hock such as

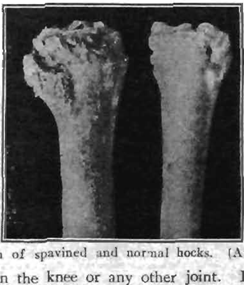


Fig. 89. Comparison of spavined and normal hocks. (After Hayes.)

is not experienced in the knee or any other joint. Hence arises, it may be conjectured, the particular liability of the part to an inflammation, the result of which is the union of the bones and their consequent strengthening to a degree capable of withstanding jar and concussion.

Of course, it is only in horses with a formation of hock recognised as defective that such causes would produce an untoward effect, and it is almost invariable that spavins do not occur on well-shaped hocks, that is, hocks which are symmetrical, and which have such a due mechanical balance of shape as to satisfy the sense of proportion in the observer. On the other hand, hocks too much bent or sickle-shaped, and those which are "deep" from front to back, and at the same time narrow or "tied in" at the junction of the hock with the cannon bone, are the ones most prone to be affected with spavin. It is because such defects of conformation are notoriously transmitted hereditarily that the disease which they principally predispose to, viz., spavin, is regarded as an hereditary unsoundness; not that the disease itself is transmitted, but that the shape of hock in which it most often occurs is.

SYMPTOMS.—Very often lameness is present before there is any obvious enlargement at the seat of spavin. The inflammatory action is going on

Fig. 90. Front view of spavined hock. (After Dollar.)

Fig. 91. Back view of spavined hock. (After Dollar.)

before any bone is thrown out, but the local heat is seldom sufficient to be detected except by those having the most acute sense of touch. In some cases when pressure is applied to the seat of spavin pain may be evinced by the animal lifting the leg up, but this is not a reliable test, as a fidgety horse will do this under any circumstances. The "*action*," however, of spavin lameness is usually of so distinctive a character as to enable a diagnosis to be made, and the peculiarities may be summarized as follows:—

(*a*) When standing in the stable the weight is taken off the affected limb, which is placed in a forward position, the heel being raised from the ground continuously. This causes the back tendons to gradually contract, in consequence of which, and of the lack of bending of the hock during progression, the toe of the shoe is always the most worn.

(*b*) When a spavined horse is made to "stand over" suddenly in the stall, he exhibits lameness by a sudden dropping and quick jerking up again of the lame limb; he also always steps over on his

toes. If he is sharply turned "in hand," *i.e.*, within his own length, he exhibits the same flinching action as when "put over" in the stall.

(*c*) Most lameness is shown when the horse is first taken out of the stable in the morning or after a rest. It lessens with exercise, and may pass away to a great extent after he has gone a mile

Fig. 92. Hind hoof of spavined horse showing wearing of toe. (After Hayes.)

or two, but there always remains an apparent stiffness or lack of complete bending of the back joint, and apparently also of the stifle joint.

(*d*) The lameness consists in carrying the hock stiffly, and going with a hopping or tripping action on the toe, a mode of progression that has been aptly likened to that of a running hen. There is

Fig. 93. Flexing the hock to test for spavin. (After Hayes.)

apparent dragging of the toe and a consequent wearing of the hoof at that part. (See Fig. 92.) Percivall has it that the lameness "consists in a sort of spasmodic 'catching up' of the spavined limb the moment the heel of the foot comes down upon the ground, something after the manner of stringhalt."

(*c*) When the affected limb has been held up for some time in a state of flexion, as in shoeing, it is brought to the ground again with very great difficulty, and, if the horse be moved on immediately, the lameness is extreme for the first few steps, the characteristic "hen-running" action being very distinct. As a doubt-relieving measure this test is very reliable. (See Fig. 93.)

The visible enlargement at the seat of spavin, when present, is, of course, a valuable aid to the determination of the cause of lameness. (See Figs. 90, 91, 95, and 96.) It may be best seen when standing opposite the shoulder at about an arm's length distance. When viewed from this position the inner line of a sound hock is usually straight (see Fig. 94); but when a spavin is present there will be a fullness or bulging of the line towards its lower end. Such fullness may appear in a perfectly sound horse which has rough or "coarse" hocks, but in such a case it will be present on each hock. In judging of the existence or other-

Fig. 94. Clean hock. (After Hayes.)

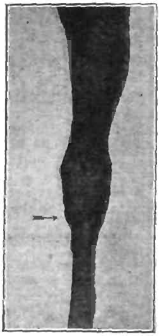


Fig. 95. Coarse hock. (After Hayes.)

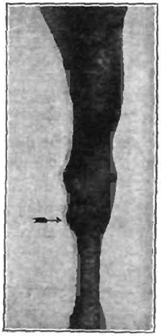


Fig. 96. Spavined hock. (After Hayes.)

wise of spavin, this question of bi-lateral symmetry, *i.e.*, the sameness of shape and contour of both hocks, is an important one. In the absence of any of the characteristic symptoms detailed above it is a sound rule to decide "no spavin" when both hocks are exactly alike, no matter the size and shape of the fullness, especially in horses of "bony" type.

TREATMENT.—The object of treatment is to hasten the completion of the inflammatory action by which the bony deposit is formed—to hasten the union of the bones involved into a solid mass; so that the exciting cause of pain and lameness, which is the attrition or rubbing together of the inflamed bones, may be removed. To this end, either blistering or firing is the most effective procedure. Neither should be attempted if there is a great amount of local heat or pain, but this is not common.

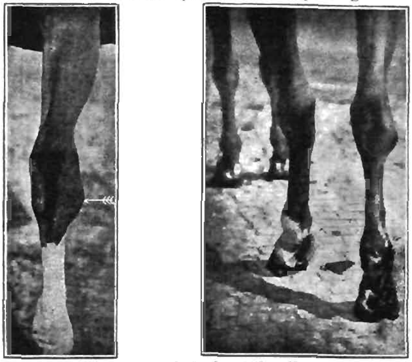
As a blister, red mercury ointment is perhaps the best. It should be rubbed in vigorously, and will in most cases require to be repeated at intervals of a few weeks. Failing success from blistering, firing should be resorted to without hesitation; in fact, were it not for the permanent

blemish caused by firing it would always be considered the more satisfactory treatment. It is of a surety always the most certain. Point firing is to be preferred before line firing, and the punctures, of which from three to five will usually suffice, should be sufficiently deep as to penetrate into the bony growth.

While complete rest is not absolutely essential, any work which imposes a strain on the hock will retard the completion of the bony union. Consequently it is advisable to turn the horse out for a spell of two or three months, during which time the foot of the affected limb should be shod with a high-heeled shoe, so that strain on the hock may be lessened.

Jarde.

This condition, sometimes designated "false spavin," is a bony enlargement of the head of the outer splint bone corresponding in situation on



Figs. 97 and 98. Jarde. (After Hayes.)

the *outer* aspect of the hock to spavin on the inner aspect. (Figs. 97 and 98.) Though unsightly it is a condition of little importance as it is seldom or never associated with lameness.

Curb.

CURB is the common name given to an enlargement situated at the back and lower part of the hock. (See Figs. 85, 100, and 101.) It is best seen from the side, and appears as a bulging (about three to four inches from the point of the hock) in an otherwise straight line from the point of the hock to the back of the fetlock. The enlargement is consequent on a sprain (with swelling) of a ligament (the *calcaneo-cuboid* ligament) which runs downwards from the point of the hock and is inserted into the lower bones of the hock and the upper part of the cannon bone posteriorly.

One function of this ligament is to keep the hock bones in position, and in severe cases of curb when it has been inordinately sprained the lower bones of the hock, particularly the *cuboid* and *small cuneiform* bones, may be actually displaced and spring backwards.

CAUSES.—As with spavin, curb occurs most frequently in horses with defectively formed hocks. The formation most fertile in inducing curb is that in which the point of the hock (the summit of the *calcaneum* bone, corresponding to the heel-bone of man) is largely developed, while the hock is narrow or "tied in" at the lower part. In such hocks, the muscles attached to the point of the hock, under the influence of great or sudden exertion, cause such a strain to be put upon the calcaneo-cuboid ligament as to severely sprain it or tear it partially from its lower attachment. It is under such circumstances as springing out of boggy or holding ground on the "take-off" side of a jump or when drawing heavy loads uphill that the strain inducing curb most often occurs. Curbs seen in young unbroken horses are the result of sprains sustained while "at play" in the paddock or in jumping.

Fig. 99. No curb. (After Hayes.)

Fig. 100. Curb. (After Hayes.)

The term "curby hocks" as implying a condition of soundness with the shape of curb is a misnomer; there is either a curb or there is none. If by the term is meant a shape of hock predisposed to curb (as, for instance, "sickle hocks") it may be admissible.

SYMPTOMS.—In most cases the enlargement is evident from the first, and may be most distinctly seen when standing at right angles to the horse, the straight and perpendicular line from the point of the hock to the fetlock showing a bulge at the seat of curb. Old standing curbs seldom cause lameness, the parts having been strengthened by the swelling they have undergone, but newly-sprung curbs often cause great lameness. In such

cases when the pain is acute the animal stands with his limb flexed and the toe resting on the ground in order to take the tension off the back part of the hock. When put into motion he advances the limb normally, but flinches when the weight is thrown upon it, and there is a consequent dropping of the opposite quarter.

Fig. 101. Curb. (After Dollar.)

TREATMENT.—Blistering with either red mercury or fly blister is usually efficacious. In obstinate cases it may have to be repeated or firing may have to be resorted to. Line firing is most advantageous. Until lameness is completely removed rest should be enjoined and a high-heeled shoe put on.

CONTRACTED TENDONS AND KNUCKLING OVER.

These two conditions frequently accompany one another and are fairly common in the hind limbs of old horses that have been subject to a lot of wear and tear. Horses used for heavy draught uphill, and half-bred horses with upright pasterns and round fetlocks are the usual subjects. In the first place there is sprain of the back tendons (see page 262) and consequent thickening and contraction. The knuckling over follows on the straightening of the fetlock by the shortening of the tendons, and is often responsible for stumbling.

TREATMENT.—To cut short the tendency to contraction after sprain, line firing of the back tendons between the knee and fetlock is to be recommended. No beneficial results follow any attempt to stretch the tendons by shoeing with thin heels and keeping the toe long. The object to be aimed at is rather the relief of the continuous strain on the tendons, and for this purpose high-heeled shoeing should be adopted.

SHIVERING.

The nature of this affection of horses and the symptoms of the associated lameness or irregularity of gait will be fully dealt with in the Chapter on nervous diseases. Its detection has already been referred to when methods for detecting lameness were being dealt with. (See page 212.)

STRINGHALT.

Considered as an "imperfection of action" this affection is entitled to be dealt with under the heading of Lameness. (See Fig. 102.) Its importance, however, from an Australian stand-point, in view of its great

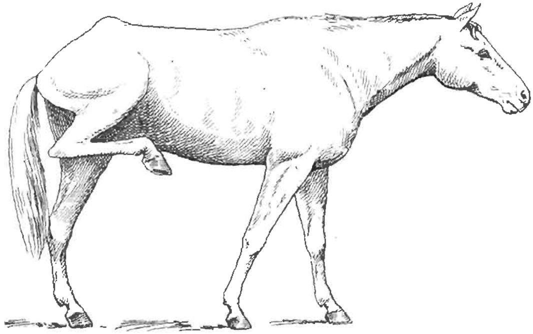


Fig. 102. Stringhalt. (After Dollar.)

prevalence, its epizootic character and the variation in course and symptoms from the standard type of stringhalt met with in other countries, demands separate treatment, which will be given in the Chapter on diseases of the nervous system.

RHEUMATIC LAMENESS.

Lameness from rheumatism in horses is of two kinds principally:—First, that which is fleeting or erratic, following on an attack of acute rheumatism or rheumatic fever; and secondly that which has its permanent seat in a joint in which rheumatism has "settled" termed RHEUMATIC ARTHRITIS or RHEUMATIC JOINT DISEASE.

Acute Rheumatism.

In this case the lameness is intermittent and metastatic or migratory in character. A horse may be lame for a day or perhaps a week, and then appear to go quite sound for a time when the lameness will suddenly develop again in an obviously different part of the limb or in another

limb altogether. Sometimes the lameness is accompanied by swellings or puffiness of tendons or joints, and the symptoms will vary with the location of the lameness for the time being.

Treatment.—In the case of intermittent rheumatic lameness the treatment should be by systemic means and should aim at getting rid of the rheumatic poison (see page 219). The avoidance of draughts and chills should be attended to and regular but gentle exercise given. Hand rubbing of the part for the time being affected, or the application to it of a stimulating liniment is often advantageous (see page 75).

Rheumatic Arthritis.

This may occur in almost any joint though it is rare that joints other than the hip, stifle, hock, and fetlock are affected, and as a rule only old horses are subject to it. Different symptoms are exhibited according as one or other of the joints is affected, but the lameness is usually more painful than that arising from other causes. When the joint is forcibly moved a "creaking" sound may be emitted. The articular surfaces of the joints are involved for the most part. They lose their covering of cartilage and become roughened on their opposing surfaces, which become hardened by a deposit of a calcareous or porcelainous character. Later on swelling of the bones takes place and they become united (anchylosed).

Treatment of the rheumatoid arthritis is usually of no avail. Sometimes the pain may be lessened by the application of a fly blister or, when very acute, temporary relief may be afforded by the hypodermic injection of morphia (see page 60).

INTERNAL LAMENESS.

Occasionally cases of lameness are come across which completely baffle all attempts at diagnosis. The lameness may be persistent and may appear to exist in a particular region, but, even after the lapse of considerable time, no change of structure or other sign of disease is found to develop. For instance there is a form of lameness affecting the right shoulder which is supposed to arise from disease of the liver. It may be accompanied by a jaundiced condition of the visible mucous membranes, but usually, except the cause is guessed at, it remains obscure until death, when on *post mortem* examination the liver is found to be cirrhosed.

In like manner thrombosis (or blood clot) in the large trunk veins of the hind limb (the *iliac* veins) gives rise to a form of lameness the cause of which cannot be definitely ascertained until examination after death.

Elsewhere[1] I have recorded a case of obscure lameness in a horse caused by inflammatory disease of the spleen with enlargement. In this case the most prominent symptom was a stiffness in gait or lameness of the near hind limb (the same side as the spleen) the action of which was peculiar. On advancing the limb, which was done stiffly, the animal seemed to cringe as if pain was caused and the limb was suddenly stopped short of a proper step. Intermittent colic was an associated symptom. This lameness was evidently caused mechanically by the pressure of the abdominal contents against the spleen causing or increasing the pain when the limb was advanced.

[1] *The Australasian Veterinary and Live Stock Journal*, January, 1891.

PASTEURISING HOME SEPARATOR CREAM.*

W. A. Herkes, Dairy Expert.

During the past export season, the greatest fault found in butter manufactured at many factories handling home separator cream was its irregularity of flavour, that is, when taking sample boxes for examination, three different butters were often found, and hence a difficulty in arriving at an average value has been experienced. In these times when the British and other oversea buyers are demanding uniformity, we must, if we desire to hold our markets, produce an article which is uniform in flavour, texture, aroma, colour, &c. Buyers here have continually told us that they cannot touch certain butters as they cannot depend on getting the same quality from day to day. Now, so far as I am able to judge, there are two methods by which this desirable end can be attained. One is the attachment—compulsory if necessary—of a cooler to all home separator plants and quick delivery, and the other is the pasteurisation of cream at the factories. The two combined would, I feel sure, go far towards levelling up our output to a considerable extent. My paper to-day will deal with pasteurisation and its possible application to home separator cream.

Some five years ago I had my first experience in this system of pasteurisation, the cream treated being the very worst obtainable, and while the results were slightly in favour of pasteurisation, it seemed to me that if an improvement however slight could be made with poor cream, how much greater theoretically would the improvement be in cream of good and fair quality. One or two factories have since that time adopted the principle in treating their home separator supply, and I hope the managers of these factories will make known the results of their experience.

Some twelve months ago I was instructed by the Superintendent of Exports, Mr. Crowe, to carry out experiments at various factories, and after demonstrating at one factory—being called to other work—the matter was for a time laid aside. After the close of the export season, the matter was again taken in hand, and I propose to give you a short *résumé* of the experiments made, and to recommend for your discussion a few of the problems I have met.

I may state that so far as we went with the plant at the three factories visited, reports, with one exception, have been favorable to the pasteurised butter. However, you will this morning have the opportunity of judging the various samples of pasteurised and non-pasteurised butter, and thus forming your own conclusions. Prices with one exception were ¼d. to ¾d. per lb. higher than for the same cream manufactured without pasteurisation. You will see by this that it will be well for us to discuss this question as fully as possible. In our experiments the usual supply received at the various factories was treated.

Coming to the principle of pasteurisation, it is hardly necessary to say that it means the heating of the matter treated through a continuous heater, up to a temperature of 155 degrees F., or over. This heating, as

*Paper read at the Fourteenth Annual Conference of the Australasian Butter Factories' Managers' Association, held May, 1907, at Melbourne.

you are no doubt aware, destroys a large proportion of the living organisms contained in milk or cream. This being effected, we have a fair field in which to cultivate our pure lactic organisms which, so far as we at present know, give to butter not only its best flavour and aroma, but its best keeping qualities.

According to McKay and Larsen (*Principles and Practice of Butter-making*), the Danish Government compels the pasteurisation of milk, cream, and skim milk, with the object of checking the spread of disease, in addition to securing uniformity in manufacture and better quality. Before going further, I wish to make myself understood on a matter that may appear contradictory, viz., I believe that as good butter can be made from home separator cream as from milk supply, and I unhesitatingly assert that the greater proportion of inferior butter exported is the product of the home separator. Under proper conditions, choice butter is made, but under improper conditions and unhealthy competition the reverse is the result. The efficient pasteurisation of this product removes taints of various fodders, grasses, &c.; in fact when cream is in anything like good condition, there is no question but that an improvement can be made. Just how far we can go I hope to be able to in some measure to show you, when what I say is taken in conjunction with the various samples shown to-day in the room.

Coming to the practical results of the experiments, I have found that it is possible to go much further in the pasteurisation of cream from an acidity point of view than has been commonly supposed. Of course, the fresher the condition of cream the better, but even sour cream, say of an acidity of .55, can be pasteurised if over 40 per cent. fat, but to look for good results from cream of this acidity would, as a rule, be an error. Before going further I want to draw your attention to one peculiarity in connexion with pasteurising home separator cream, and I think it largely assists in the success of the system. It is this:—the heating of cream to 160 degrees F., or over, considerably reduces the acidity, as shown by the titration test, and the higher the temperature and the more acid the cream, the greater the variation. The explanation given is that certain volatile acids are driven off in course of pasteurisation, and such being the case, it is reasonable to suppose that if we can reduce cream showing an acidity of .4 to .3 or .35 we can then successfully cultivate another lactic acid ferment which will assist in the manufacture of a higher quality butter.

The advantages of pasteurisation are:—

1. Improved flavour.
2. Improved texture.
3. Improved price.
4. A butter that can reasonably be expected to keep longer.
5. The uniformity from day to day of a factory's output.
6. Freedom from all, or nearly all, disease germs.

With regard to the advantages, the securing of uniformity from day to day, week to week, and probably from factory to factory (that is if we could systematise our methods and use the same cultures from factory to factory and I believe we can), would enable us to produce a butter which would hold its own in any market in the world. I want you to recognise that the only difficulty in the way of pasteurising four-fifths of the supply received at country butter factories can be overcome by a little co-operation between factory and supplier.

Reverting to our trials. I found that cream of an acidity up to .35, if sound, could be manufactured into choicest butter. Cream up to .45, allowing for a reduction in acidity, could be made into a good keeping and carrying butter, or, to put it more plainly, I am of opinion that all 93. butter can be made superfine, and a large proportion of our 92. butter can also be made superfine, provided efficient pasteurisation and pure cultures are used.

The plant required for pasteurising is simply a heater, but pasteurisation must be followed by quick cooling. We must remember that improper pasteurisation is worse than no pasteurisation, and pasteurisation without proper cooling is just as bad. In treating cream at various acidities, I believe that 160 to 165 degrees F., is the best temperature at which to run cream under .35 acidity, and for cream over this acidity a temperature of 170 to 175 degrees F. You will find that with this latter temperature there will be very little danger of coagulation in the pasteuriser. A cream which will go stringy or coagulate at 145 to 150 degrees will be found to go through easily at the higher temperature, and that is the main difficulty in pasteurising home separator supply. This particular aspect of the question should not be lost sight of.

When we have decided to pasteurise, we must also decide to use pure cultures; they necessarily go together, and the making of a pure starter is, under ordinary circumstances, the most difficult thing in the system. In the preparation of starters it is expedient to use either a commercial culture, or one received from some reliable source, such as the University Laboratory. The small bottle received is first of all propagated in two gallons of skim milk which has been pasteurised for an hour in the water tank at from 170 to 180 degrees F., and cooled to 90 degrees F. This is allowed to stand from 14 to 16 hours at a fairly even temperature when it will be found coagulated. Of course sterilised vessels must be used, and kept covered with clean butter cloth. When the starter is coagulated, it must be skimmed, thoroughly broken up and then added to, say, 20 gallons of pasteurised skim milk cooled to 90 degrees, which, on the following day is ready for use in cream. Sufficient should be kept over from day to day to propagate enough pasteurised skim milk for use each succeeding day. The starter should be always of smooth texture, not lumpy, and should not be used if showing whey. If proper care is taken a starter may be used for as long as three months, and if it lasts six weeks it is evidence of good work. The quantity of starter must be regulated by the temperature, length of time of ripening, &c. Personally, I would cool in the vicinity of 60 degrees F., and 8 per cent. starter, and have ready for churning in 14 to 16 hours, at a temperature of 56 degrees F.

Coming to the cost of the system. I would like to have the experience of those managers who have been practising the method. There is the extra labour, heating and cooling. I have been given to understand that one horse plant is sufficient for heating 300 gallons per hour and driving the necessary machinery. I have found it impossible in my experiments to arrive at the cost of heating. Storch, in working it out, puts it at one-fifth of a farthing per lb. of butter when milk is treated. Where there is plenty of water available, the cost of cooling is practically nothing. I have reduced the temperature of pasteurised cream as much as 100 degrees with water circulation alone. Another method is to have jacketed tanks. Still another method is to have agitators in the cream vats. One other point is that cream which has been pasteurised makes a butter of better texture,

and can be churned cleanly two degrees higher than the non-pasteurised. This would be a considerable item in the output from a big factory in regard to refrigeration.

There are two things that we must keep in mind, one is that milk sugar, from the breaking up of which lactic acid is formed, does not according to Richmond disappear in milk or cream in the same ratio as lactic acid makes its appearance, and the other is, as stated before, the reduction in acidity during pasteurisation.

To summarise, factories which have heating and cooling power at command, and are troubled with irregular quality, should have no hesitation in inaugurating this system, but unless temperatures are under control, and care exercised in the making of the starter, the work is best left undone.

There is another stand-point from which managers should look at this system. If as we are given to understand, pasteurisation is going to make so great an improvement that ½d. per lb. more can be obtained, and it being recognised that considerable improvement must be made in many of our co-operative factories with regard to appliances and fittings before they attempt pasteurisation, managers, would, I think, do well to move their directors towards this much to be desired end. One more advantage which would tend towards helping co-operative factories in the country is, that with uniformity and a ½d. per lb. higher price, they could compete on more advantageous terms for supplies. In conclusion, I will state my opinion of the system. Given proper pasteurisation and reasonable delivery of cream to factories, and with the use of pure cultures and absolute cleanliness, we have the solution of the home separator question with regard to the greater proportion of material received at our country butter factories. If, as I believe, a better keeping article which meets the taste of the British buyer can be produced, this must react to the benefit of the industry, and also of the producer, who, once he finds it will pay him to deliver to factories more often will assuredly do so, and thus do his share to remove what I stated at the beginning of this paper to be the greatest fault of our home separator butter, viz., its irregularity of flavour from day to day.

GRADING AND LEVELLING.

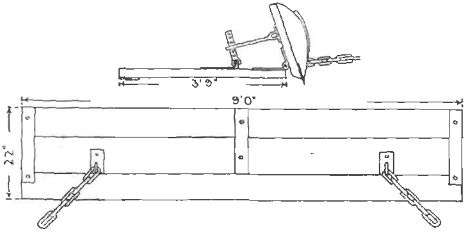
(Continued from page 327.)

A. S. Kenyon, C.E., Engineer for Agriculture.

The buckscraper (see the *Journal* for June) appears under a great variety of forms. Reference has already been made to its original form with the tail-board at right angles or nearly so to the bottom. To show

THE SMOOTHER AT WORK.

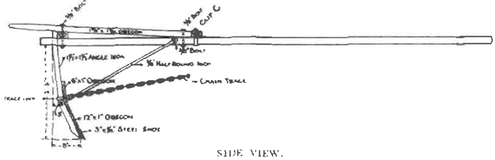
the advances made in the construction and use of this implement, a drawing is here given of a scraper used in California some 18 to 20 years ago.



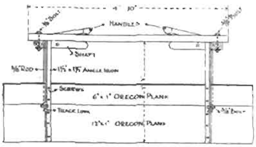
THE AMERICAN BUCKSCRAPER.

The length is 9 feet, and the vertical height of the face-board in working set, is about 20 inches. The planks are $\frac{3}{2}$ inches thick, and bolted on to the lower edge is a steel plate, 12 inches by $\frac{3}{8}$ths of an inch, projecting 6 or 7 inches below the woodwork. At the ends, cam-shaped wooden skids,

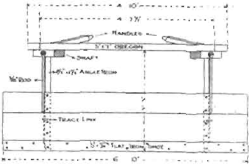
faced with iron plate, serve for the scraper to ride on when tipped, and serve also to facilitate the pulling back into working position when required. The tail-board is long, 3 feet 9 inches, and is hinged to the planks. The cutter may be set at different working angles by means of a tie rod as illustrated. In use the driver stands on the tail-board, his weight pressing the cutting edge into the ground, which has been ploughed



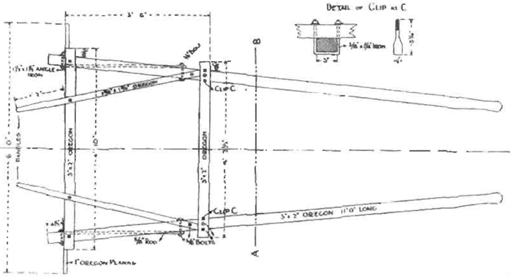
SIDE VIEW.



BACK VIEW



SECTION AB FROM FRONT.



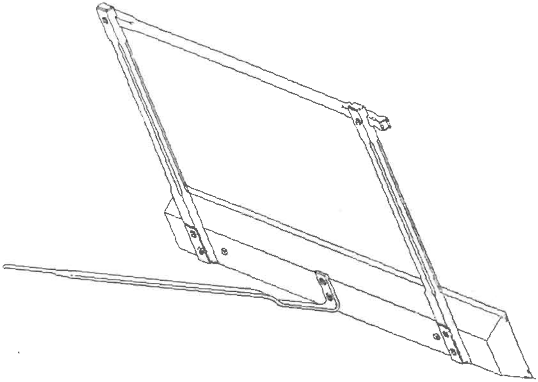
PLAN LOOKING DOWN.

THE PERKINS SCRAPER.

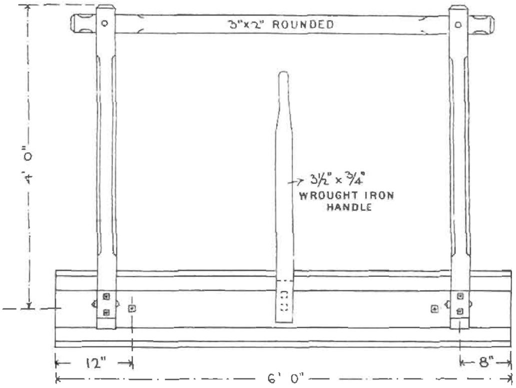
if too hard to be shifted without. When his weight is removed, the drag of the team turns the scraper over and distributes the load. As shown, it will shift over one cubic yard a trip, and is a heavy working tool for a four-horse team. This form has but few of the merits of the steel scraper already described, and will not, except in very light sandy soils, do such cheap work in muck shifting as the scoop

Another form of the buckscraper which cannot be used on skids and consequently is only of service with a short "lead," that is, where the distance the earth has to be transported is not great, is the "Perkins" scraper, a Victorian invention. As will be seen from the description of its use, it is made as light as possible, the face-boards being 1-in. oregon only, fastened to 1½-in. angle iron braced to the shafts with half-round iron. The shafts are long, and have two handles coming over the hind crossbar. The draught chains are attached to the angle irons by a trace link at the bend. A strip (3 inches) of ¼-in. steel is attached to the lower faceboard to form a cutting edge. As the essence of this scraper is in the backing, saddle and breeching are required for the horse and travellers on the shafts. The mode of using is as follows:—The ground to be shifted is first ploughed, shallow for preference. The multifurrow plough is the most economical as the scraper will not cut much more than 3 inches deep at a time. One horse only is employed, and a separate driver is required. The man working the scraper puts his weight on the handles to press the cutting edge into the ground and the horse moves forward. When filled, which means about ⅛th of a cubic yard, only sufficient weight is kept on it to prevent it rising above the dirt. At the end of the lead, the man turns round, grasps the handles, lifts the scraper—the weight being about 60 lbs.—and walks back to the ploughed ground the driver backing the horse at the same time, and the operation is repeated. As many as five trips a minute can be made with a short lead. The work is difficult and not effective in cloddy ground or with steep slopes. The sandy soils of the mallee afford this scraper its greatest field. An improvement is the substitution of a light steel plate for the oregon boards, as the implement will then take a deeper cut. It is, however, harder work for both man and horse.

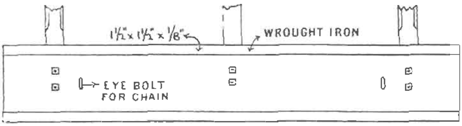
The non-riding type has many forms, ranging from the section of a round log to the somewhat more elaborate form figured herewith. The



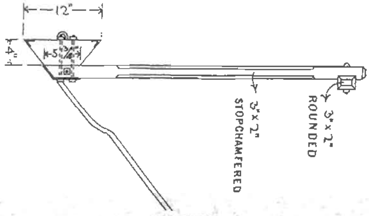
A USEFUL SCRAPER.



BACK VIEW.

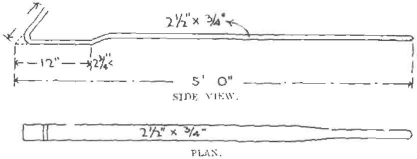


FRONT VIEW.



SIDE VIEW.

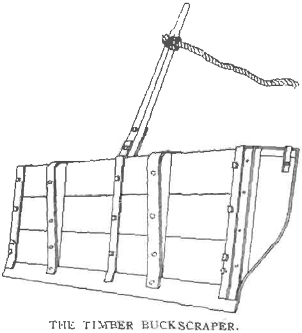
dimensions, &c., were kindly supplied by Mr. R. G. Wilson of Whittlesea. It is a useful two-horse implement, and will do good work in most soils and in most paddocks. It is, in fact, a sort of cross between the buckscraper and the smoother; but fails to combine all the good



THE HANDLE.

qualities of both. It may readily be made on the farm, the ironwork being procured from the local blacksmith. The log or cutter is of red gum, and the rest of hard wood. Both edges are shod with iron, one to serve when the other wears out or gets broken. No description is required of its manufacture as the illustrations clearly show the method. The cutting edges are secured by stout screws.

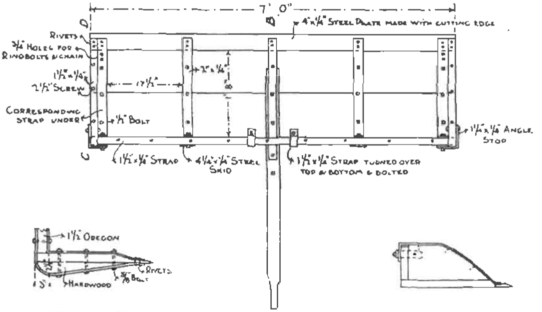
Reference has been made to the timber buckscraper, and the steel scraper was stated to be superior. The wooden form has, however, the



THE TIMBER BUCKSCRAPER.

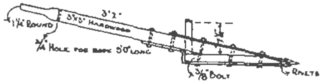
merit that it can be made by an unskilled person and costs somewhat less. The accompanying figures give a clear idea of the arrangement. All the timber should be of oregon except the handle, which is hardwood. In all practical details this scraper is identical with the steel scraper already described, (pp. 323-4). It is the same length, 7 feet, and requires a four-horse team, worked in two pairs to separate swingle-trees. The handle, which has to meet considerable strains, needs securely fastening with iron plates above and below as shown. Where the oregon joins the cutting edge, a strip of light gauge, about 20, steel is bent round

the edge of the timber for about 4 inches each side and secured with clouts. This scraper was first introduced here at Mildura the design being brought over from California. It has since spread over the whole



DETAIL OF SKID. PLAN. CROSS SECTION AT END.

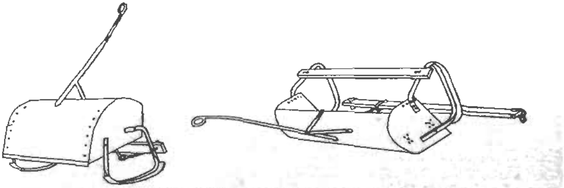
State. Mr. Lester, the manager at the Werribee Sewage Farm, uses it almost wholly for the heavy work of grading adopted there and speaks highly in its praise. The all-steel form, a modification by Mr. G. H. Tolley, manager of the Government Irrigation Farm at Wyuna, is capable of finer work both as a grader and as a leveller and is much more lasting



CROSS SECTION.

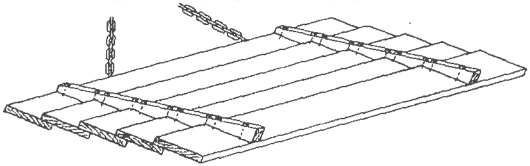
The form of the cam-shaped ends is a matter of some importance. The steel scraper was figured without any riders on end and can be worked without, but, at any rate for an inexperienced man, the addition of curved angle irons, in shape like the ends of the wooden scraper, is advisable.

A variety of scraper intermediate between the buckscraper and the ordinary scoop is known as the Fresno scraper. It is made of sheet steel

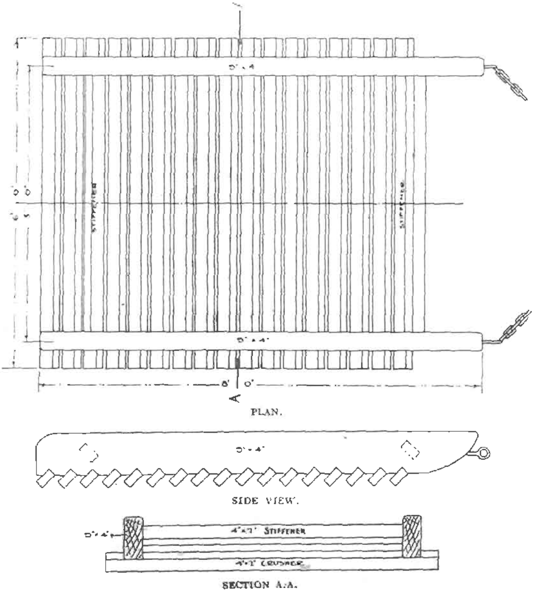


THE FRESNO TUMBLING SCRAPER.

and has a single fixed handle. On the dumping side are curved skids or runners which keep it elevated some distance above the ground. Consequently its load, whether of a very sticky nature or not, is easily tipped out. It, in fact, works well where the buckscraper would not give satisfaction, that is, with long leads, steep slopes, and sticky ground.



THE PLANKER.



THE CLOD CRUSHER.

All the implements already described will more or less be useful in levelling ground. The final operations require more delicate work. The first class of these implements includes the clod crushers and plankers. The planker is made of a series of planks, 8 to 10 inch planks bolted to cleats as shown. The length may be anything from 6 to 12 feet, and the thickness about 2 inches. It will do better work than any contrivances of logs or planks fastened to harrows, and is not expensive to make.

A more elaborate form made by Mr. Brooks, foreman at the Rutherglen Viticultural College Farm, gives more effective results where the ground is hard and cloddy. For transport, it is simply turned over and drawn backwards, the corners being rounded for the purpose.

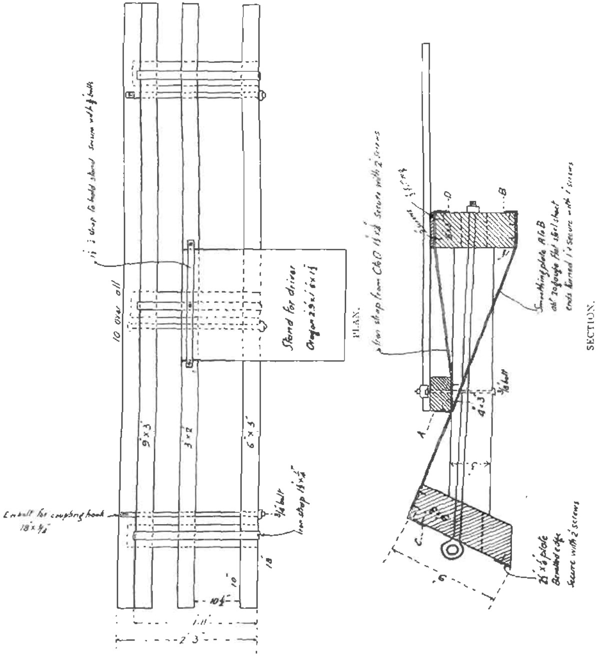
At the First Irrigation Conference held in 1890, Mr. Farrell of Areegra described the scraper used by him as follows:—

"The machine I use for levelling resembles a sledge. It has two longitudinal beams, 5 inches x 4 inches, 12 feet long. There are three pieces, 6 inches x 3 inches, 9 feet long, bolted on in front and underneath the longitudinal beams in flooring-board fashion; four more pieces of the same dimensions and length are bolted on behind and underneath, but in weatherboard fashion, with the edges set forward. Midway between those planks there is a wooden scraper faced underneath and in front with a steel plate 3 inches x $\frac{1}{4}$ inch. In the front of this scraper there are three eye-bolts which swing on a round bar of iron. There is also a 5 feet lever bolted on to the back of the scraper, with a crank underneath it. The horses are yoked to the sledge and when on the top of a clay lump the driver stands on the lever and forces the scraper into the earth, which is pushed forward until it comes to a crab-hole; then he steps on the crank which turns it upwards, lifts the lever, and the scraper swings backward and deposits the earth. The weatherboards then level the heap and break any lumps that may be in it. About five or six acres per day can be levelled with the machine, which is drawn by four horses and worked by one man. Allowing 25s. per day wages for man and horses, the cost per acre amounts to about 5s."

The most useful smoother of the lot has its original form in the split log. A log about 9 to 12 inches in diameter was split in halves, the two halves with the round sides facing one another were secured about 2 feet apart by pieces of hardwood morticed in. Eyebolts were put through the front log and chain attached so that the smoother was set on the skew. The action of the front log was to cut off any bumps or slight inequalities and the back log with its round face to smooth down the lumps and crevices. This implement is very suitable for smoothing off formations, spoilt banks, or the like, and is sucessfully in use in America for periodical trimming of formed roads in use, filling up the ruts, and allowing the water to drain off better.

The smoother shown on page 536, has been evolved from this original form. It combines a buck scraper on a small scale with a following smoother or leveller. It may be made any length convenient up to 12 feet. The method of making is clear from the drawings. The steel smoothing plate is very light, about 20 gauge, but will last a very long time. It is brought from the middle 3 x 2 beam to the underneath of the back 6 x 3 beam, and holes are cut in it for the ties and the bolts. In use, the driver standing on the plate causes, by moving forward, the front beam with its cutting edge to enter the ground and carry forward any dirt cut off and by moving backward he raises the front, allows the accumulated earth to pass under in as great or as little quantity as he pleases while the sloping steel sheet

smoothes it out, crushes the lumps and spreads it into any depressions. It is an indispensable implement for preparation of land for irrigating, especially lucerne or similar crops. While the buck scraper may often be done without, no progressive irrigationist will be without a smoother.



THE SMOOTHER.

To give those farmers who are not acquainted with the levelling and grading implements described, a set of the more important has been made for exhibition at the various Agricultural Shows should the Societies desire them as exhibits. Exhibitions of the implements in work will also be arranged in suitable localities if local provision of teams and prepared ground is made.

(To be continued.)

GUILDFORD GRASS, OR ONION GRASS.*

Romulea cruciata, Ker-Gawl. (*Iridea*).

Alfred J. Ewart, D.Sc., Ph. D., F.L.S., Government Botanist.

This pretty little Irid, the sudden appearance of whose pink flowers in grass, turf, path borders, and similar situations in spring, draws perennial attention to it, has undoubtedly become a troublesome weed in many pastures, its somewhat grass-like leaves hiding its presence until flowering occurs. Owing to its small perennial subterranean corms, its free seeding, and its generally resistant character to extreme conditions, the eradication of the plant from land of which it has once taken possession is impossible by ordinary methods, except at a prohibitive cost. Hence I have been reluctant to advise the proclamation of the plant in spite of the frequent complaints as to the serious damage it does to pastures until it was possible to give practical methods of keeping down the weed.

Proclamation under the *Thistle Act* does not necessitate immediate eradication, since conviction may be suspended provided that the Justices are satisfied that the person affected has used and is using all reasonable exertions to destroy the plants in question. Since the methods given at the end of this article will insure the complete or almost complete suppression of the weed on agricultural land at the end of two or three years without any cost which is not represented by an increased value or yield from the land, no further objections to the proclamation exist, and its presence may be used as a lever to secure better methods of cultivation.

The following is an extract from the *Proceedings of the Royal Society of Victoria*, Vol. XIX., page 43 (1906), in regard to this plant:—

"1. This widely-spread Irid with rose-lilac flowers, and tough grass-like leaves, is commonly known as Guildford grass or Onion-grass, and was originally referred by F. von Moeller as *Romulea bulbocodium*, L. It is given in Rodway's *Flora of Tasmania* as *Trichonema roseum*, Ker., which is a synonym for *R. rosea*, a South African plant. Both the species, however, have the style longer than the stamens, whereas our plant resembles the *R. cruciata*, distinguished by Ker. Gawl. (*Botanical Magazine*, 1802, plate 575) from *R. rosea* and *R. bulbocodium*, by the style shorter than the stamens and the hairy filaments. Baker, in the *Flora Capensis*, makes this species, *R. longifolia*, Baker, but the three purple stripes on the outer perianth segments given by Baker are absent or very feebly developed, and the spathe segments are smaller (½ cm. long in flower to 1 cm. in fruit), the inner segment having a broad scarious margin. The leaf, as in the type specimens of *R. cruciata*, often has a fifth groove on one edge for a portion of its length. The character of the spathe segments justifies the recognition of an Australian variety of *R. cruciata*."

"There can be no doubt that the short style with its six very short stigmatic arms, which separate as the stamens shed their pollen, is an adaptation for self pollination. The flowers, which are strongly thermonastic, only open on warm sunny days and do not seem to have any regular insect visitors. The plant grew abundantly in the neighbourhood of the Botanic Gardens over 40 years ago, and may date further back still, for its increase is favoured by the conditions attendant on the presence of civilized man. Probably if specimens had been collected from the early part of last century we would have received evidence of adaptive modification on the part of this plant, but whether *R. cruciata* var. *Australis* is derived from *R. bulbocodium* or *R. rosea* is impossible to say. In any case the whole genus of *Romulea* is badly in need of revision. Experiments on the extermination of this weed are in progress at the Herbarium and in the Domain grounds. The use of pigs has been suggested to root out the corms from the ground, and

* Proclaimed under the *Thistle Act* for the whole State, August, 1907.

T. S. Hall has recorded before Field Naturalists' Club, that white cockatoos coming north from the Otways have performed the same office, and by digging out the corms have cleared patches of ground infested by the weed.

"*Mr. C. French, jun., reports* that he has often seen children eating the bulbs, although to the novice the taste is by no means pleasant. A quantity of the corms crushed and washed through a fine sieve yielded an abundance of fine quality starch, so that, were it not for the expense of collecting the bulbs, they might form a profitable source of starch. The seeds are also highly nutritious, and it is owing to the sparrows and other birds which eat the seeds that the plant is so rapidly and widely spread. Future investigations may show some use for the seeds. The stalk of the fruit capsule is strongly geophilous, and curves down towards the ground during ripening. In loose ground it is sometimes partially or completely covered before the seeds are shed."

To the foregoing the following accounts of the experiments on the eradication of this plant may be added. Plots of land were selected in which the weed was very abundant and uniformly distributed. These were marked out into areas one yard square. Some were treated with poisons and manures, others were cut or pulled, others mechanically treated by digging, and still others planted with other plants to see if they would suppress the weed.

Suppression by Pasture Plants.—In the hard, dry, poor soil in which *Romulea* flourishes, no good pasture plant appears able to suppress it according to field observations. Plants actually tried were Lucerne (*Medicago sativa*); Black and burred Medick (*M. lupulina*, *M. denticulata*); Birds foot Trefoil (*Lotus corniculatus*) and various clovers such as the white, red, and subterranean and strawberry clovers (*Trifolium repens*, *T. pratense*, and *T. subterraneum* and *T. fragiferum*.

Poisons and Chemical Manures.—These were applied on 16th September, 1906, *i.e.*, before any new seedlings were established, and the final countings made in June and July, 1907. The results are well shown in the appended table:—

Substance.	Amount per Sq. Yard.	No. of Plants remaining in 1907.	Condition.
Ammonium Sulphate ...	½ lb.	860	Darker green
Potassium Nitrate ...	¼ lb.	820	About normal
Untouched Plots ...	...	550-900	" "
Common Salt ...	1 lb.	320	Stunted
" ...	2 lbs.	260	Stunted, bare of other vegetation
" ...	¼ lb.	400	Nearly normal
Sulphuric Acid ...	1 lb.	280	Stunted, and ground nearly bare
Arsenite of Soda ...	1 oz.	360	Apparently normal
" " ...	2 oz.	250	Somewhat greyish green

Evidently poisons are quite ineffective except at a prohibitive cost and in quantities which would render the ground useless for long periods of time. Nitrogenous chemical manures encourage the *Romulea* as much as they do neighbouring pasture plants.

Mechanical Methods.—To loosen the soil and pick out the corms is impossible on a large scale. The corms occur from near the surface to nearly 6 inches depth according to their age and to the character of the soil, so that it is a day's work to pick out all the corms from a square rod of badly infested ground, which equals a labour charge of over £100 per acre.

A plot was selected containing approximately 460—500 plants per square yard. One square yard was dug over and a top dressing of

1 inch of horse manure applied. After one year it contained 260 plants of *Romulea*. A second plot, dug over only, contained 320 plants. A third was dug over 12 inches deep, so that the top 6 inches were placed at the bottom, and the plants covered with at least 6 inches of soil. It contained after one year 210 plants. A similarly treated plot was covered with an inch of horse manure. It contained after one year 160 plants only.

Evidently therefore the weed can be best suppressed on pasture land by manuring, ploughing, and bringing the land under cultivation for a time. A leafy crop like potatoes is the most suitable at least for the first year, since *Romulea* loves hard, dry ground where it receives plenty of sun, and with potatoes the ground is well worked and kept open. *Romulea* develops its leaves, however, from April to October, so that to cut light from it a cold-resistant crop like winter wheat is best.

It is often curious to notice how *Romulea* follows hard tracks along roads without passing into the fields through the soft ground by the wire fences, and enters the fields through the gates where the ground is trodden hard, and the other vegetation is short. A mere wire fence under which the ground is soft and the vegetation longer than outside or inside suffices to keep the plant out of a field for a considerable time after it has travelled or been carried down a road. Loosening the soil and keeping the stock from it for a time would have the same effect in the open pasture. Mr. Cameron has suggested that stock carry the corms on their feet from place to place, and hence into the fields, but this is very unlikely, although *seed* might be carried in this way. The chief agents in spreading the seeds are birds, however, and the corms maintain the plant wherever it has become established without aiding in its spread.

The abundant presence of this plant on pasture land may be regarded as a sign that the pasture is in poor condition, and that the soil needs opening, loosening, and manuring. No plants with single bulbs or corms flourish under a system of rotation farming, and they only prove really serious on overstocked natural unimproved pasture land, where no provisions are taken to restore the balance of nature disturbed by the presence of the stock.

The weed, though preferring dry ground, can also stand a good deal of moisture, so that flooding land is of no avail in its extermination. In fact, of a number of corms kept under water for two months, and then air dried for two months, over 60 per cent. produced new leaves when planted. The mere encouragement of a heavy growth of grass by resting the land, by top dressing with stable manure (not chemical manures) coupled with a scarifying of the surface to loosen the soil aids greatly in keeping down the weed, and such treatment pays in results for its cost.

Treatment for Lawns and Cricket Grounds.—The tough wiry grass-like slightly channelled leaves appear above ground usually in April, and are actively assimilating food until September or October. Flowering begins usually in August, and seed are formed until October or even November. Hence the leaves must be kept closely cut all through winter, and this steadily exhausts the plant. The grass should be cut closely or mown with a machine as often as the leaves attain any length, and whenever any flowers appear. This should be done in as dry weather as possible to avoid compressing the soil by too much trampling when moist. If necessary light top dressings may be used, of short well decayed stable manure, and two years of such treatment should practically free any cricket ground or lawn from the pest, or greatly reduce it.

Paths and Roadsides.—Along the borders of paths the weed does no very great harm and forms a pleasant and pretty harbinger of spring. If seeding is prevented by cutting the flowers, or by passing a hoe through the leaves and young flower stalk, an inch or so below the ground in August or September, the plants are kept under and prevented from increasing or spreading. Along the hard borders of broad stock roads the sod should be turned by ploughing either once in July, or in May and September. It would pay in most cases to allow the neighbouring land owners to take in the useless breadth of most of these roads on condition of keeping them clean from weeds. Roadside tree planting of evergreens is also of use. *Romulea* will not grow beneath closely planted Acacias, and such planting would add greatly to the beauty and comfort of many of our bare country roads. All factors which loosen the soil, enrich it in humus and cut off light in winter time, aid in keeping down the weed. Pigs are of some use in rooting up and eating the corms, but methods of this kind are always more or less untidy and patchy ways of cleaning land.

THE PROCLAIMED PLANTS OF VICTORIA.

(*Continued from page* 498.)

Alfred J. Ewart, D.Sc., Ph.D., F.L.S., Government Botanist; and J. R. Tovey, Herbarium Assistant.

St. Barnaby's Thistle.

Centaurea solstitialis, Linn. (*Compositæ.*)

A stiff, erect annual, one to two feet high, with few branches, and covered with a white cottony wool. Radical leaves pinnatifid (like a feather); upper leaves small and linear, decurrent in long, narrow wings along the stem. Flower-heads solitary at the ends of the branches, nearly globular; the innermost bracts ending in a small shining appendage; the intermediate ones in a long spreading prickle, with one or two small ones at its base; the outermost usually with only a few small, palmate prickles. Florets of a bright yellow. Fruiting heads with a soft white pappus.

An introduction from Southern Europe. It should be dug out with a hoe or mattock before the seeds mature, piled and burnt. It often flowers after cutting if fairly old and left too long.

Proclaimed for the Shire of Wodonga, April, 1899.

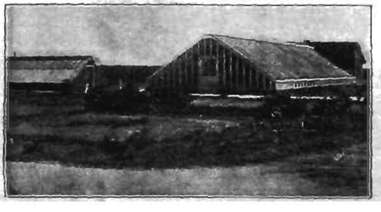


PLATE 16

ST BARNABY'S THISTLE

(Centaurea solstitialis, Linne)

GARDEN NOTES.

J. Cronin, Inspector, Vegetation Diseases Acts.

The Anemone.

Anemone is a genus of dwarf, perennial, herbaceous and tuberous rooted plants, indigenous to portions of Europe, Asia, Africa, and America. A large number of species is known; many are highly decorative, the flowers being of varied form and colour, while others are of little value as garden plants. The average height of the tuberous rooted species is less than 1 foot, some of the herbaceous kind attaining a height of 4 feet. The so-called florist's anemones have been derived from *anemone coronaria*, the poppy anemone, a native of South East Europe, florists having raised from this species numbers of types and varieties that produce large blooms of varied form and colouring, combined with increased vigour in the growth of the plants and more profuse blooming. The anemone was at one period largely grown and freely exhibited, but like other garden flowers its cultivation, for some inexplicable reason, was abandoned for some time, but of late years the plant has again become a favourite subject of cultivators chiefly on account of the excellence of some of the newly distributed types, of which the St. Brigid strain, Crown anemone, is a conspicuous example, the flowers exceeding in size and brilliancy those of the older varieties.

In this State the anemone is regarded as one of the most effective and easily cultivated of spring blooming plants, growing freely in most soils, and not requiring to be watered to produce its growth and bloom, owing to the fact that during the dry and hot period of summer the plants are in a state of rest. The tuberous rooted varieties are specially suitable for cultivating in places where water is scarce, a fine display of bloom being obtainable for little trouble and outlay during August, September and October. Anemone Japonica and its varieties are also valuable garden plants. The original species is a native of Japan, and in no way resembles the spring blooming kinds. The plants are fibrous rooted, herbaceous perennials, and the growth and flowers are produced during summer and autumn. The flowers are white, and rose in colour, and are borne in umbels on stems from 2 to 4 feet in height. Although classed as a hardy plant this anemone requires cultivation and moisture during the summer months.

CULTURE.

The most suitable soil for anemones of the tuberous rooted class is a moderately light loam which should be well drained to insure success. The addition of clay, or heavy loam to light sandy soils, or sand, ashes, or well decayed manure to heavy soils, will bring them to a condition suitable for the culture of these plants. They may be grown in beds specially prepared for them, or as patches or individual plants in beds or borders. The most important point in their culture is that no manure should come into contact with the tubers or even near them, or their destruction is inevitable. In very poor soils some old and well rotted cow manure may be thoroughly mixed with soil at a depth of below 6 inches from the surface, but no fresh manure should be used. The tubers may be planted from February to May; where blooms are desired early an open and sunny position should be selected. Tubers should be planted at a depth of 2 inches in heavy soils to 3 inches in light, care being taken that the crowns are placed uppermost. When the plants are grown in

special beds the tubers should be set out in rows from 1½ to 2 feet apart, allowing from 9 to 12 inches in the rows for each plant. The same amount of room is advisable between each plant when anemones are grown to produce patches of bloom in beds or borders. Except in very dry places, or when planting is deferred till late in autumn, the spring blooming anemones will not require any artificial watering during a normal season, and the only cultivation required is to hoe between the rows or patches, and keep the plants free from weeds. When the plants have finished blooming, and the stems and leaves are withered, they should be lifted, and after being dried, stored away until the planting season arrives. Plants allowed to remain in the ground will flower early in winter, but fine weather is essential for the production of blooms of good type and quality.

ANEMONE, JAPONICA.

ANEMONE, CORONARIA TYPES.

Anemones of spring blooming types are increased by dividing the tubers, and from seeds. After the plants are lifted and dried, they should be divided, before storing, into pieces, each containing one or more eyes or buds. Seeds should be saved from the finest types and flowers, which may be crossed fertilized with ease. The anemone produces seeds freely, the seeds being clothed with a woolly covering and clinging together. They should be separated before sowing, the easiest way being to mix with them a quantity of dry sand or other gritty material, and rub them until they separate. They may be sown as soon as ripe, in small beds or boxes of fine soil. The young plants soon appear, and should be kept free from weeds and watered during dry weather, which will enable them to develop into fair plants, many of which will flower during the same year. After dying down they should be stored and replanted in season; when the tubers are very small, sifting from the soil is the common practice. If a good selection of seed is made some fine varieties may be produced. A Melbourne nurseryman has made a specialty of anemones of the St. Brigid strain, and by careful crossing and rigid selection has produced varieties much superior to any imported. His displays of cut flowers at the spring shows, and in the beds at his nursery, were a revelation to gardeners and the flower-loving public. Seeds and tubers of single and double forms of *a. fulgens, hortensis,* and *coronaria,* are procurable at Melbourne seed warehouses.

The Japanese anemones will thrive and produce their blooms freely under ordinary border conditions. The plants are increased by divisions of the crowns, which may be done in autumn or early spring. Varieties available in Melbourne are:—*A. Japonica*, rose; a double form of the same kind; *a. Japonica, alba*, white; and Honorine Joubert, and Whirlwind, white, larger and finer than the type.

Flower Garden.

The breaking of the rough surface left after digging is the most important ground operation at present. Where the soil is heavy and retentive it will be found that a coarse lumpy surface is best attacked while comparatively moist, and after being pulverised a fairly smooth surface can be readily maintained in a loose condition and the moisture in the soil conserved.

A perennial gardening task is the destruction or prevention of insects and fungi, the work being greatly minimized by attacking the parasites early in the season. Flowers of sulphur dusted on plants of roses known to be liable to mildew; or sulphide of potassium used as a spray wash, at the rate of 1 oz. to 3 gallons water, against rose mildew and rust on carnations are well known preventives of such fungi. Tobacco or soap washes are effective against aphides, the most general of the insect enemies of garden plants in spring. A most thorough application is necessary, the aim being absolute extinction if possible.

Beds for the reception of chrysanthemums grown for exhibition should be ready by the end of this month. If properly prepared during winter a digging will be sufficient, the main object being aerating the soil and thoroughly mixing the manure through it. Where a choice of plants is possible, moderately strong and sturdy plants should be selected, avoiding extra large and sappy, or weak and spindly specimens. Of the new varieties grown last season a few of the most promising are:—Richard Seddon, terra-cotta red; Miss Alexander, rosy cerise, reverse silver; Mrs. Jas. Whitton, white; Mrs. Bischoffsheim, deep yellow, overlaid with pink and red; Mrs. C. Beckett, white; Valerie Greenham, pink; W. A. Etherington, silvery mauve; Lady Conyers, rose pink, silvery reverse. Plants of chrysanthemums intended to produce large numbers of flowers may be planted at once. Three suckers planted about 1 foot apart in a triangle, will produce fine large plants before their season of blooming. Carnations should be staked, the growths tied regularly, and an excessive amount of shoots reduced to a few if fine flowers are desired. The buds on the selected shoots should also be thinned, the large terminal bud being selected to remain in most varieties. In many varieties that produce large flowers that invariably lose form by bursting the calices, a secondary bud should be saved, the flower resulting being smaller but of much superior form.

Seeds of tender plants may be sown in boxes, or in beds if provision is made for sheltering the young plants from frost, if necessary. Seeds of dahlia, and a number of annuals that would be killed by frost if raised earlier may be sown at the end of the month. A finely pulverised and firm surface should be prepared for small seeds, and some light soil, well mixed and sifted should be at hand for covering the seeds. Plants of hardy annuals and perennials raised from seed earlier in the year may be planted out when large enough. Another batch of gladioli may be planted, the Lemoinei varieties, if selected, producing their flowers in December and January. Divisions of dahlia tubers may be planted for early blooming, a piece of the stem with the tuber attached being sufficient to produce a

large plant. A spot sheltered from hot winds should be selected if possible, as the plants will flower in mid-summer. A liberal allowance of manure should be deeply worked into the soil for each plant. The Pompon dahlias are useful for summer blooming, and resist hot winds better than the Show and Cactus types.

Kitchen Garden.

Ground should be prepared, as recommended for flower garden, for transplanting and sowing seeds of vegetables required. A condition of fine tilth is necessary to insure a fair amount of success, the after cultivation being also much easier if the soil is thoroughly pulverised before being planted or sown. Growing crops should be kept free from weeds which grow rapidly at this season, and the surface should be stirred as frequently as possible.

Seeds of a number of vegetables may be sown including peas, beans—French beans at end of month in warm places—cabbage, cauliflower, celery, carrot, parsnip, &c. Plantings from former sowings may be made as plants are ready.

Tomatoes may be planted out, but should be sheltered from cold winds and frost. Most market gardeners of experience hold the opinion that little is gained by planting before October. The contention is that the plants are not likely to receive a severe check, and accordingly early fruits are produced with less trouble. A test of a number of varieties was made in the garden of a prominent cultivator last season, to determine the best early variety. Key's Prolific was the earliest to produce ripe fruit, followed closely by Earliana and Early Jersey. The last named is a promising kind, the fruit being of fair size, good quality and borne freely.

POULTRY FOR EXPORT.

H. V. Hawkins, Poultry Expert.

REDUCTION OF RAILWAY RATES.

For some considerable time farmers have complained of the poultry freight rates charged by the Railway Department, with the result that the matter has been favorably considered by the authorities. Poultry (living) in crates, coops, and cases, formerly in Class I., is now charged under Class "C," subject to "Smalls" minimums. Taking the mileage rates *per ton* for the two classes it will be seen that there has been a substantial reduction.

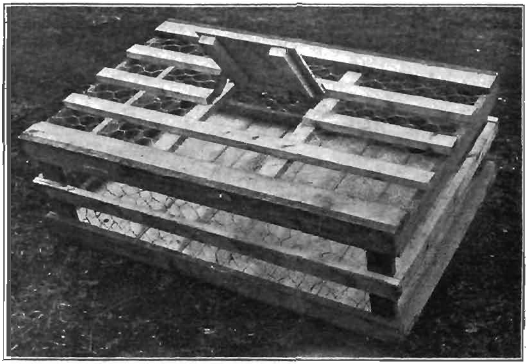
Miles	25	50	100	150	200	250
	s. d.	*s. d.*	*£ s. d.*	*£ s. d.*	*£ s. d.*	*£ s. d.*
Class I. ...	9 0 ...	17 3 ...	1 14 0 ...	2 10 6 ...	3 3 0 ...	3 15 6
,, C. ...	7 6 ...	13 9 ...	1 6 3 ...	1 18 9 ...	2 8 0 ...	2 17 3

For empties the rates have been amended as follows:—

Crates and coops, empty returned, not exceeding 17 cubic ft. measurement	Not over 101 miles, 3d. each 102-150 ,, 6d. ,, Over 150 ,, 9d. ,, or Class B, minimum 6d., when cheaper
Crates and coops, empty returned, exceeding 17 cubic ft. measurement	Not over 100 miles, 6d. each 102-150 ,, 9d. ,, Over 150 ,, 1/- ,, or Class B, minimum 6d., when cheaper

The above rates may also be charged for new empty crates and coops sent to the country to be filled for return by rail.

Now that the reductions have been made it behoves the farming community to show its appreciation by placing poultry raising on a proper basis. Many things should be done, viz., renovating old houses, replacing perches, new ones to be 3 inches wide and 18 inches high, repairing fences, getting rid of the old crossbreds and starting anew on good sound lines. By these means the farmer will increase his returns and the export trade will be developed. There is no need to fear a glut in the market as Great Britain will take all we can supply. So far we have only touched the fringe of the poultry trade. The Department of Agriculture by lectures, demonstrations and articles has left no stone unturned to disseminate information relative to the requirements of the trade, and the producer has, therefore, no ground for excuse.



A LIGHT AND SERVICEABLE CRATE.

The accompanying illustration is that of a crate weighing 46 lbs., which has been approved by the Railway Department and will be found very convenient and serviceable. The size over all is:—length 4 feet, width 2 ft. 7 in., height 1 ft. 3 in. The frame consists of 3 x 1 and 2 x 1 deal battens, with ribs of 1½ x ¾ deal to protect the wire (1½ in. mesh), whilst the floor is made of 9 x ½ deal. The door is 12 x 9. Crates at present in general use weigh at least 65 lbs. each, so it will be seen that a large reduction in weight has been secured; at the same time there will not be any increase in cost.

REQUIREMENTS OF THE TRADE.

Farmers generally know by this time that the consuming public requires eatable poultry—not feathers and legs but white meat. I would again remind my readers that the breeds which will meet the requirements, and bring top prices in Melbourne and London, are those having length of body and short legs, the latter to be white, with no feathers thereon, and free from scales. The order of merit in which, in my opinion, the breeds

should be placed and the average weight of chicken they will produce when crossed are as follow:—

Breeds on Female side.	Breeds on Male side.	Number of Hens required.	Average weight of Progeny at 5 months.
1. Silver Dorking (2nd season)	Indian Game ...	6	7½ lbs.
2. Buff Orpington	Indian Game ...	6	7 lbs.
3. White Orpington ...	Indian Game ...	8	6¾ lbs.

The foregoing is based on the results of experiments carried out by me last season.

It should be distinctly understood that Indian Game hens are very poor layers; they should therefore not be used unless there is a difficulty in securing the other breeds enumerated. One of the main factors in farming poultry is to secure stamina, without which there is sure to be a loss at the end of the season. The above breeds embrace all those characteristics which go to produce the desired results. Always aim to reduce feather and remember that feathers require feed, and that there is no payable market for feathers, whereas there is always one for good flesh.

FOOD TO PRODUCE WHITE FLESH.

Chickens should not be fed until quite 24 hours after hatching. Then give hard-boiled egg (shell included) chopped up finely with double the quantity of breadcrumbs, every two hours for the first few days. Give a little and often, but on no account should any be left as sour food is disastrous to young chicks. When a week old, change the diet to coarse oatmeal and broken biscuits, slightly moistened with sweet milk—avoid making it pasty; add a little charcoal and very finely pulped raw onion. It is also very necessary to place on some clean boards ample coarse sand, fine gravel and a very small quantity of pure bone meal, as these are most essential to the chicken's proper development, *i.e.*, to make bone and to keep the gizzard in a vigorous condition. Digestive disorders of all things should be guarded against; therefore avoid giving green bone as there are more chickens killed by this than any other thing that I know of.

At my own place where I conduct experiments many people, on seeing the healthy, well-feathered, young chicks, have asked what food I use. I have used a variety of grains, and my experience is that it is not so much what the food is as how it is supplied, providing it contains the necessary constituents. In nature, small seeds, insects and grass furnish food for chickens. These are most abundant in the spring and summer months, and it is at this time that chickens thrive. To secure the best results, foods simulating both the composition and the mechanical character of these should be supplied. For instance, in the summer the tips of grass are young and tender and are easily broken by the chickens. For green stuff to be easily assimilable, some plant should be supplied which may be easily broken. Hanging a head of lettuce in the brooder by a string will furnish the desired want and be greedily taken by the chicks. Sifting the cracked grain scraps and cracked wheat through sieves, so as to remove both the meal and larger pieces, gives favorable results. Millet seeds, hemp seeds, rolled oats, and other grains of this character are greedily eaten and well digested.

POTATO EXPERIMENTAL FIELDS, 1906-7.

George Seymour, Potato Expert.

The experiments conducted during 1906-7 are largely a continuation of the previous year's operations. They are so entirely as far as the manure dressings on the varieties planted on the 5 acre forage fields, where artificial manures, lime and farmyard manure comprised the dressing, are concerned. But as artificial manures has not hitherto given satisfactory results on the rich volcanic soils, and there being instances on record where the yield was greater where no manure was used, it was accordingly decided to try a combination of farmyard and artificial manures for this class of soil. Three plots were laid out for this purpose; one at Mr. Lane's farm at Koroit; another on Mr. Walter's farm, Coghill's Creek; and the third at Mr. T. A. Park's farm, Romsey; the latter field had also a subsoiled section. The results may be considered encouraging, but as it is impossible to form definite conclusions from one year's operations, it has been considered advisable to carry on the experiment for another season.

Artificial manure and lime separately were used on the plots where little or no farmyard manure is available, because it is recognised that any scheme of manuring to be of practical value shall be of such a character that where results prove it to be profitable farmers in the district will be able to adopt it. Plots of this class were situated at Kinglake and Emerald. The plots at Turkeith and Kilmore were also treated with the same dressing. Briefly stated the manuring was as follows:—

1. Artificial manure, lime, and farmyard manure.
2. Farmyard and artificial manure in combination.
3. Artificial manure and lime.

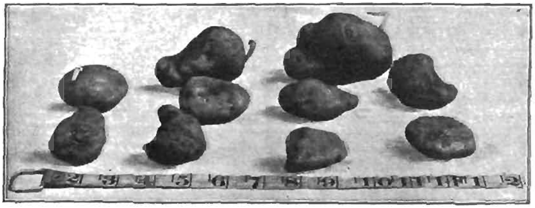
The results of these experiments are dealt with by my colleague, Mr. F. E. Lee, Agricultural Superintendent, on page 556.

In dealing with the plots generally it must be borne in mind that some of them are not on potato land and the only hope of obtaining a moderate crop is meeting with the most favorable weather conditions during the whole growing period of the plant. It may not be out of place to state that any soil can be converted into a potato producing soil and much can be done artificially to combat unfavorable weather conditions but the cost is out of all proportion to the average value of the crop. One of the fields of this character is that at Mr. Anderson's farm, Digger's Rest—one of the 5 acre forage fields. The section used for potatoes was under cereals during 1905-6, was worked up to a very good tilth and, when planted in August, was in very satisfactory condition. The soil may be described as a clay loam with coarse gravel, having clay patches here and there throughout. This field was planted on 3rd August when the soil temperature ranged up to 55 degrees at noon which may be considered satisfactory for the season. Four weeks after planting a heavy fall of rain occurred—5 inches or over fell in a couple of days—and destroyed all chance of a crop. The next field to suffer from similar conditions was Mr. Wylie's at Turkeith. This field is a clay soil with a slight admixture of fine sand and is very tough and sticky when wet. It was planted on 19th October, which may be considered late for this district, but owing to heavy rains in September it was impossible to prepare

it for earlier planting. The results although poor were better than might have been expected. A portion of Mr. Wylie's crop beside the plot was a total failure, and I attribute whatever success was obtained to Mr. Wylie's efforts to restore the land to a proper condition after the heavy rains. The most disappointing field was that on Mr. Walter's farm at Coghill's Creek. This plot was to have been planted early in October but weather conditions interfered with the preparation of the land and delayed the work of planting until the 13th November. The crop came through well but met with dry weather during the growing period and early frosts checked the growth. The soil on this field is of superior quality, a chocolate volcanic, but lack of humus made it too sensitive to weather conditions.

Influence of Humus.

The accompanying illustration of a number of tubers taken from a field that was in first class condition when planted as far as tilth was concerned will show what effect heavy rains have on a soil that is deficient in humus. Every tuber is pressed out of shape, some are about two inches diameter and little more than a quarter of an inch thick. Although the



MISSHAPEN TUBERS.—EFFECT OF SOIL DEFICIENT IN HUMUS.

plant will sometimes thrive fairly well under such conditions it is impossible for it to produce a crop of tubers. Much stress is laid by all writers on the preparation of the land for a potato crop on the necessity of reducing the soil to a fine tilth, but where the organic matter of the soil has been exhausted by constant cropping, without a proper rotation, the finer the tilth the worse the conditions become under the influence of heavy rain, for the soil runs together and the water lies in pools all over the surface instead of soaking into the land, and if the rain continues long enough, it courses down in little rills till it gathers in volume carrying away whole breadths of the field. It is impossible to over estimate the influence of humus on crops, especially the potato crop.

Probably the greatest decline in the fertility of the soil is brought about by constant cropping with grain. It may not be out of place to give the results of experiments at the Experiment Station, Minnesota, U.S.A., to compare the influence of continuous cropping with wheat and that of a rotation of crops on the humus content and fertility of the soil. On one plot each wheat, oats, barley and maize were grown continuously for four years; on another plot the following rotation was practised, wheat, clover, wheat, and oats; and on another plot, oats followed by clover, barley, and maize, with manure, were grown. The gain or loss of humus

during the four years in the different plots is shown in the following table:—

System of Cropping.	Humus at beginning.	Humus at end of 4 years.	Gain + Loss —
	per cent.	per cent.	per cent.
1. Wheat continuously	3.30	3.00	– 0.30
2. Wheat, clover, wheat, oats ...	3.30	3.80	+ 0.50
3. Oats, clover, barley, maize ...	3.30	3.50	+ 0.20
4. Maize continuously	3.30	3.10	– 0.20
5. Oats continuously	3.30	3.08	– 0.22
6. Barley continuously	3.30	3.10	– 0.20

With continuous wheat cropping there was an annual loss of 1,800 lbs. of humus per acre whilst on the rotation plan of maize, oats, and barley there was a gain of above 1,500 lbs. and in the other rotation with clover over 2 tons. As humus is one of the principal sources of nitrogen, in the case of continuous wheat growing the annual loss of nitrogen was 146 lbs. over and above that utilised by the wheat crop or for every 1 lb. used by the crop 5 lbs. were lost to the soil whilst in the clover rotation there was an annual gain of 61¼ lbs.

A glance at the above table will show what an important factor clover is in the renovation of the soil. Heavier yields of potatoes and a better quality of tubers are largely bound up in this question of a proper system of rotation and especially one including clover. If larger areas of the best potato lands of the State were utilized for dairying and grazing, a little more than half the present area of potatoes would produce as heavy a return of marketable tubers.

Selection of Seed.

The importance of the selection of potatoes for seed received careful attention during the harvesting of the crop, 1905-6. The varieties were culled and notes were made of the proportion of rejects. This selected seed was used in the 1906-7 fields and reference to two or three lots will suffice to show the influence of a proper system of selection on the quality and yield of the crop. The varieties which have suffered most through want of care are the red skinned. This may be accounted for by the fact that they have been longest in cultivation; the practice of taking small or undersized tubers for seed year after year without any regard to the plant which produced them is responsible for much of the decline of this variety.

One parcel of seed of this variety was taken from a plot planted by Mr. Jellie of Woodford with the following results:—

Average yield—6 tons per acre.
Wild plants, 25 per cent. } both rejected.
Yellow fleshed plants, 50 per cent. }

The return of market and seed tubers per acre was 1½ tons and of rejects 4½ tons. The selected seed was planted in Mr. Park's plot at Romsey, and the results are most striking. The gross return of the section was 7 tons 10 cwt., made up as follows:—6 tons 18 cwt. marketable seed, and 12 cwt. small. The money value of market and seed potatoes at 50s. per ton and of small at 20s. would work out as follows per acre:—

	£	s.	d.
Market and seed. 6 tons 18 cwt. at 50s. per ton ..	17	5	0
Small, 12 cwt. at 20s. per ton	0	12	0
Total	17	17	0

The value of same if planted in similar conditions to the plot of 1905-6 would have been—

	£	s.	d.
Market and seed, 1 ton 17 cwt. 2 qrs. at 50s. per ton	4	13	9
Rejects sent to market, 3 tons at 30s. per ton ..	4	10	0
Small, 2 tons 12 cwt. 2 qrs. at 20s. per ton ..	2	12	6
Total	11	16	3
Balance in favour of selected seed ..	£6	0	9

PIT SHOWING PRODUCE OF SELECTED SEED.

The effect of selection on what may be considered a good strain is shown by a parcel of seed from selected plants and a parcel of ordinary seed taken from a bag ready for market, as follows:—

Selected Seed.

	£	s.	d.
Market and seed, 6 tons 18 cwt. at 50s. per ton ..	17	5	0
Rejects, 1 ton 3 cwt. at 30s. per ton	1	14	6
Small, 9 cwt. at 1s. per cwt.	0	9	0
Total	£19	8	6

Ordinary Seed.

	£	s.	d.
Market and seed, 5 tons 10 cwt. at 50s. per ton ..	13	15	0
Rejects, 2 tons 3 cwt. at 30s. per ton	3	4	6
Small, 19 cwt. at 20s. per ton	0	19	0
Total	£17	18	6

In the above calculation the $5\frac{1}{2}$ tons of market tubers are put down at the same price as the selected, viz., 50s. per ton, but there was fully 7s. 6d. per ton difference in value; again the rejects of the selected are put down at 30s. the same as ordinary, but they were quite 10s. per ton above them. With this alteration in prices, it raises the gain of the selected from £1 10s. to £4 14s. 3d. per acre in favour of selected seed. *It should be stated that the crop from which this parcel of seed was selected was at the time of selection bringing the top price in Melbourne.*

Another instance may be quoted. The parcel of seed used in this test was selected from a field of the following standard—70 per cent. rejected as wild or bad colour. The following letter, dated 11th July, 1907, which I have received will testify to the improvement by selection:—

"From selected seed (that is, selected as you showed me in 1906) I got 91 bags. I measured the ground, and it worked out at 5 tons per acre. They cut beautifully, and you will see by the photograph that they are all marketable potatoes. From the same measurement on either side of this block I sowed potatoes carefully selected from pit, and I got 72 bags on one side and 73 on the other. The potatoes from these two were not half the quality, and also in the 72 bags there were nearly six of them small, and in the 73 there were six bags small, and a great quantity of seed size. The photograph shows the potatoes as they are in the pit, just as dug, big and small together; there are very few small, as you will see."

The illustration shows the condition of the crop from selected seed as it appears in the pit, and the market value of the crop will be seen in the following statement. The other illustrations will make the matter perfectly clear. The produce of the ordinary seed is shown in the two bags *a* and *b*, and the selected in *c* and *d*, each lot weighing 79 lbs.:—

Selected Seed.

C., Market, 71 lbs. D., Small, 8 lbs. = 79 lbs.

Ordinary Seed.

A., Market, 37 lbs. B., Small, 42 lbs. = 79 lbs.

The yield and market value per acre of the two parcels are as follow:—

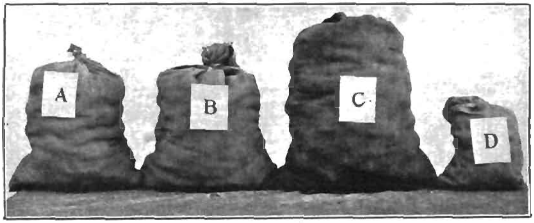
Selected Seed.	£	s.	d.
Market, 4 tons 8 cwt., at 50s. per ton	11	0	0
Small, 12 cwt., at 20s. per ton	0	12	0
Total	£11	12	0

Ordinary Seed.	£	s.	d.
Market, 1 ton 18 cwt., at 50s. per ton	4	15	0
Small, 2 tons 1 cwt., at 20s. per ton	2	1	0
Total	£6	16	0

In the above calculation *a* is given the full benefit of top market price but could not be considered worth within 5s. to 7s. 6d. per ton of *c*.

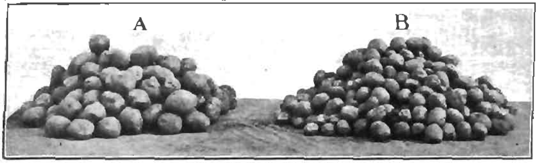
The photographs and calculations should be sufficient proof of the advantages to be gained by adopting a proper method of selecting seed potatoes. While it may be more advantageous to buy a good strain of seed than lose a couple of seasons working up a grower's own stuff, it must be borne in mind that a method which will raise a crop from 30 per cent. of good plants to 90 per cent. in one season will if applied keep the standard up to a high level. It may not be practicable and

indeed is not necessary to apply this rule to the whole crop. The following plan is suggested—Suppose a grower plants 20 acres of potatoes every



PRODUCE OF SEED.
A and C, Marketable; B and D, Small. (A and B are from Ordinary Seed, and C and D from Selected Seed.)

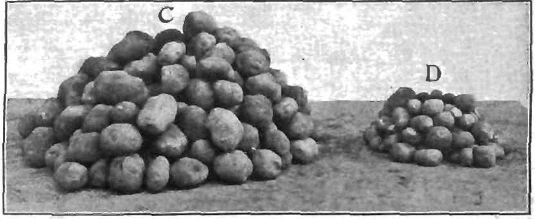
year; let him at digging time select about 1½ tons of seed which should plant about three acres. The produce of this should be sufficient to plant



GRADED FOR MARKET.
Produce from Ordinary Seed.

the whole 20 acres next season and by this means the whole area will be planted with the produce of selected seed every year.

As regards change of seed, which in the ordinary acceptation of the term means selling out and buying some one else's seed sometimes inferior



GRADED FOR MARKET.
Produce from Selected Seed.

to one's own, if a grower is careful in the selection of his seed it would be better to send some of his own to another district where it could be

grown on a different soil and in this way he would improve the constitution of the plant and the tubers produced by it. Instances could be given where growers have kept their produce up to a very high standard for upwards of 25 years without changing their seed, but this can only be done by careful selection.

GREEN OR IMMATURE SEED.

For some years past the most progressive potato growers in Great Britain have advocated the use of immature seed. This is obtained by lifting the tubers while the plant is still green. In saving seed in this manner it is advisable to let the tubers lie on the ground till they become green; if the weather is hot cover them with the haulm to protect them from the sun, but if the potato moth has made its appearance they should be gathered at once. During last season this experiment with "green v. ripe" seed was carried out on two plots, and was distinctly in favour of the green seed. The parcel of green seed used in the experiment was kindly provided by Messrs. Birtchnell Bros., of Swanston-street, Melbourne, and formed portion of a show of tubers exhibited in their window in December, 1905, and removed to the Government Cool Stores in January, 1906, where it remained till the following November. When the seed was taken out it began to throw out buds in a few days, the shoots being strong and healthy.

The variety used was Beauty of Hebron, grown by Mr. Lynch at Carrum. One test was caried out at Mr. P. J. Duff's farm, Carrum, with the following results:—

	Tons	cwts.	qrs.	
Green or immature seed	5	8	3	per acre.
Ripe seed	4	0	3	per acre.
Yield in favour of green seed	1	8	0	

It must be stated that the produce of the green seed was a much better sample with less small and undersized tubers. The second test was carried out at Mr. Gray's farm, Emerald, but for some cause, not apparent at the time of planting, 23 sets out of 156 missed while 7 of the ripe seed also missed. The return per plant was again in favour of immature seed. The green seed gave a return of 3 tons 6 cwt. 3 qrs. while the ripe seed yielded 2 tons 8 cwt. per acre, or a gain of 18 cwt. 3 qrs. These experiments are to be continued in next season's plot. The above results were also confirmed by a small experiment carried out by Mr. J. McLennan, Head Teacher of the Emerald State School, where the immature seed gave double the yield of the ripe and more than twice as many large tubers. Altogether the experiments may be considered to point to the fact that immature seed will give the most satisfactory returns.

THE VARIETIES.

The heaviest individual yield of any section of the plots was obtained on section (*b*) of Mr. R. I. Argyle, M.L.A.'s, plot at Kyneton which gave a return of 16 tons 8 cwt. per acre with an average of 13 tons 10 cwt. over all sections. This variety was planted under the name of Blue Prolific and is identical with Coronation and Kinglaker; it was also planted at Emerald and Kinglake. At the latter place it was planted for comparison with Kinglaker and at both places it gave rather a light yield, but when compared with Brown's River in these tests it appears a very suitable variety for both districts. At Kinglake it gave a return of 2 tons 2 cwt. per acre; Brown's River gave the same weight but produced a

little more than twice as many small, the weights being Blue Prolific small 14 cwt. 1 qr. 24 lbs. per acre; Brown's River small 1 ton 10 cwt. 25 lb.,

The following table will show the market value of the two varieties:—

Variety.	Gross Yield.	Weight of Small.	Value @ 20s. per ton.	Weight of Seed and Market	Value @ 50s.	Total Value.
	Tons cwt. qrs.	Tons cwt. qrs. lbs.	£ s. d.	Tons cwt. qrs. lbs.	£ s. d.	£ s. d.
Kinglake.						
Blue Prolific ...	2 2 0	0 14 1 24	0 14 6	1 7 2 4	3 8 9	4 3 3
Brown's River...	2 2 0	1 10 0 25	1 10 0	0 11 3 3	1 9 4	2 19 0
Emerald.						
Blue Prolific ...	2 19 2	0 8 0 3	0 8 6	2 10 3 0	6 6 10	6 15 4
Brown's River...	3 2 0	1 4 3 0	1 4 9	1 17 3 0	4 14 3	5 19 0

A gain of 23s. 11d. per acre is shown at Kinglake and 16s. 4d. at Emerald. The market value of both varieties is put down at 50s., but the Brown's River produce was not worth within 5s. to 7s. 6d. per ton of Blue Prolific.

During the last few years there has been a great increase in the number of white skinned varieties, many of them not being suitable for local trade, while there have been practically no new reds, except The Gem of the South, a new red skinned variety raised by Mr. Russell Kidd of Invermay, Tasmania. A few small plots were planted last season and from reports to hand appear to have done well. Actual weights were supplied in one case only and then the yield was equal to 15 tons 15 cwt. 3 qrs. per acre, with a very fine sample of tubers and scarcely any smaller than seed size. This variety possesses all the points of a first class Brown's River and it is to be hoped that it will receive a fair trial in the coming season; should it prove a much heavier yielder than the latter it will be welcomed in the late districts. Another dark-skinned variety planted under the name of Black Prince gave satisfactory returns; it has a dark purple skin, and if not identical with the Blue Derwent, it bears a strong resemblance to that variety. It is rather liable to second growth, and consequently requires a favorable season, so that the tubers may develop without a check. Sometimes they develop a purple ring inside, but this disappears in cooking; a number of tests as to its cooking quality was made at all stages of growth and from all kinds of soil, the results being entirely satisfactory.

Among the white-skinned varieties planted, Up-to-Date, Sutton's Abundance, and Clark's Main Crop gave good yields; the latter produces a large number of tubers, and unless it meets with favorable conditions, produces too many undersized tubers, Up-to-Date on the other hand has very few small. Fox's Seedling, which is an early variety, proved a heavy cropper, and of good quality. Cook's Favourite, which is a sport of Carman No. 1, is proving a heavy cropper. It is a very vigorous plant, resists frost well, and is a late maturing potato of good quality; it cuts very white and cooks well. This variety was planted in only one plot, Mr. Argyle's at Kyneton, where section (*d*) gave a yield of 10 tons 6 cwt. per acre with 8 tons 10 cwt. for all the sections there being 7 tons 5 cwt. of marketable and 1 ton 5 cwt. small. The amount of small seems large but nearly half the weight was

due to heavy culling. Several favorable reports regarding this potato on the lighter soils have also come to hand. Of all the white potatoes grown at the present time Carman No. 1 is probably the best. It is of superior quality and is a good cropper, superior in nearly every point to the New Zealand Pink Eye, and worthy of more attention in districts where early crops are grown. At Mr. Walter's farm at Coghill's Creek this variety was tested against the New Zealand Pink Eye with the following results:—

CARMAN NO. 1—

Market	Small	Total
2 tons 2 cwt. (at 60s. per ton), £6 6s. ...	3 cwt. 1 qr. (at £1 per ton), 3s. 9d.,	£6 9s. 9d.

NEW ZEALAND PINK EYE—

Market	Small	Total
1 ton 11 cwt. (at 40s. per ton), £3 2s. ...	12 cwt. (at £1 per ton), 12s., ...	£3 14s.

SUBSOILING.

As the potato grows during that period of the year when least rain falls anything that tends to promote or conserve soil-moisture should prove beneficial to the crop. With these objects in view a section of Mr. Park's plot at Romsey was subsoiled to a depth of 12 inches. The crop in this section, however, did not show any increase in the yield, in fact it was slightly in favour of the non-subsoiled, but as no satisfactory conclusions can be formed from one year's operations it has been decided to continue the work for another season. This experiment is interesting inasmuch as it is in accord with similar tests carried out in America.

OTHER EXPERIMENTS.

A number of minor experiments and tests was carried out during the season in a garden plot where 44 different lots were planted ranging from 3 sets to 38. Most of these had been sent in by growers for identification and resulted in the names of many being fixed. The dry weather or hot winds interfered with or prevented the blooming of some varieties and no results were obtained regarding them.

As opinions differ regarding the value of the stem ends of tubers a field experiment to test the merits of stem and crown sections was carried out. For this purpose 500 tubers were selected of about 4 oz. weight and cut crossways into two sections, No. 1, stem; No. 2, crown. The stem sections were all planted in one drill and the crowns in the next drill with the following results. The crown sections, which many contend are the best for seed, were very irregular and produced 140 green plants bearing many inferior tubers whilst the stem sections produced only 44 green plants but the yield and general appearance of the crop were decidedly in favour of the stem sections. This experiment will be repeated on a larger scale during the coming season.

CONCLUSION.

The season was not altogether a favorable one as many districts suffered from a spell of dry weather at a critical period in the life of the plant. This was the case at Kinglake, Emerald, and Coghill's Creek, especially at Emerald, where only 66 points fell in 10 days in January and were distributed over the whole month, the heaviest fall being 25 points on the 29th. February was a little better, the heaviest falls being on the 6th, and 7th, 31 points and 66 points respectively, but such light falls are of little value to the crop. Many districts were visited by frosts as early as the first week in February.

The area planted in Victoria in 1906-7 was largely in excess of the previous year which was over 2,000 acres below the previous

season, the area for 1905-6 being 44,670 acres and 1906-7 55,372 or an increase of 10,702 acres. These fluctuations are brought about by high prices ruling when crops are light, and low prices when yields are heavy. The average per acre for last season was 3.01 tons per acre, the increased yield being 51,487 tons. It would be well for growers to work their potato areas on a rotation plan which would bring about the same quantity of land under potatoes every year, and thus as far as possible avoid a glut in the market.

A report, dealing particularly with the imported varieties, will appear in the next issue of the *Journal.*

The Effects of Manures on Potato Yields— Season 1906-7.

F. E. Lee, Agricultural Superintendent.

The interest excited by the potato experiments of the previous season brought about an extension of the work during 1906-7. The fields embraced most of the recognised potato growing centres. A slight variation was made in the manurial treatment to meet changing conditions of soil. The returns below are grouped according to similarity in manure dressings:—

Variety.	J. Anderson, Digger's Rest.						J. Ferrier, Casterton.						J. Cameron, Condah.						E. S. Hill, Iona.					
	A	B	C	D	E	F	A	B	C	D	E	F	A	B	C	D	E	F	A	B	C	D	E	F
Bismark	1.4	1.5	.4	.7	.5	.4	3.2	4.1	3.9	2.4	.5	.7	3.7	5.0	2.3	4.4	2.7	2.1	..	..	..	..	..	..
Sutton's Abundance ..	1.0	1.9	1.2	1.7	1.0	1.5	5.0	6.6	6.0	4.5	1.6	.9	..	..	..	..	..	..	..	..	..	..	..	..
Carman No. 1 ..	.4	.8	.6	.8	.5	.7	3.1	3.4	1.6	1.4	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Up-to-Date	1.3	2.7	1.7	2.0	1.1	3.0	..	..	..	..	..	..	4.2	3.4	2.0	3.2	2.5	2.1	4.6	5.7	4.7	7.5	5.8	8.6
Prolific (White) ..	.8	1.7	.8	2.2	1.2	1.3	..	..	..	..	..	..	..	..	..	..	..	..	2.0	2.4	1.3	2.3	2.3	3.2
Fox's Seedling, Early ..	1.2	.8	.6	.8	.7	1.8	2.3	3.6	3.0	1.5	..	..	4.2	3.5	2.6	3.3	2.3	3.1	..	..	..	..	..	..
Scotch Grey ..	2.0	1.7	.3	.9	1.2	1.2	3.3	7.0	5.1	4.1	.9	.5	2.6	3.2	2.5	3.7	2.3	2.2	2.7	4.2	3.0	3.8	2.7	4.6
Beauty of Hebron ..	.4	.8	.3	.6	.6	1.2	..	..	..	..	..	..	1.6	1.4	.6	1.7	1.1	.7	..	..	..	..	..	..
Lapstone Kidney ..	.4	.6	.3	.7	.4	.6	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Brown's River ..	..	..	..	..	..	..	4.3	3.7	4.0	2.4	1.3	..	3.3	3.7	2.2	3.8	2.1	1.3	3.0	3.6	2.6	3.0	3.6	7.6
Black Prince ..	..	..	..	..	..	..	..	..	..	..	..	..	2.2	3.3	2.2	3.2	1.5	1.4	4.1	3.6	3.1	4.0	3.2	6.0
Brown's River, No. 7 ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2.1	3.8	3.1	3.1	3.0	4.6
Clark's Main Crop ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	4.5	5.6	3.2	5.5	5.6	5.8
British Queen ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2.3	2.3	1.6	2.3	1.4	3.1
Bruce	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2.5	3.6	2.0	2.6	2.5	4.2
Blue Prolific	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2.7	2.6	1.6	2.1	1.9	4.1
Scottish Triumph ..	..	..	..	..	..	..	..	..	..	..	..	..	4.5	4.3	3.0	4.6	2.2	1.4	..	..	..	..	..	..
Tasmanian Red ..	..	..	..	..	..	..	6.2	4.2	5.0	3.6	1.2	1.1	2.2	3.2	2.5	2.1	2.0	1.5	..	..	..	..	..	..
Copperskin	..	..	..	..	..	..	4.5	5.5	3.0	2.5	.7	.9	2.3	3.5	2.6	3.2	2.5	3.0	..	..	..	..	..	..
Roses	..	..	..	..	..	..	..	..	..	..	..	..	.8	1.0	.5	.8	.5	.3	..	..	..	..	..	..
Warrior	..	..	..	..	..	..	..	..	..	..	..	..	3.0	4.5	1.6	4.0	2.3	2.0	..	..	..	..	..	..
Early Rose	..	..	..	..	..	..	2.5	3.2	1.5	1.7	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Late Rose	..	..	..	..	..	..	2.2	2.1	1.5	1.6	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Fox's Seedling, Late ..	..	..	..	..	..	..	3.0	5.0	1.5	1.5	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Snowflake (Local) ..	..	..	..	..	..	..	2.1	3.6	3.0	2.0	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Average ..	.9	1.3	.6	1.1	.8	1.3	3.6	4.3	3.5	2.6	1.0	.8	2.8	3.3	2.0	3.1	2.0	1.7	3.0	3.7	2.6	3.6	3.2	5.1

Manures used.—A. 2 cwt. Superphosphate. B. 2 cwt. Superphosphate, 1 cwt. Nitrate of Soda. C. No manure. D. Same as B, and ½ cwt. Potash Sulphate. E. 5 cwt. Lime. F. Farm manure.

Disregarding altogether the question of variety, we find that the effect of manuring on the yield of tubers has been as follows:—

	A.	B.	C.	D.	E.	F.
Tons per acre ...	2.5 ...	3.1 ...	2.1 ...	2.6 ...	1.7 ...	2.2

These figures confirm previous experimental work in a similar direction and point to the necessity of a supplementary application of nitrogen to the phosphatic manure. The addition of potash has caused a falling off

in yield, except in the case of the Iona field where the soil was a deep peat. The effect of lime and farm manure, particularly the former has been disappointing, but there are indications that both of these amendments must be accompanied by artificial manures.

The next group of fields differs only from the preceding in the substitution of sulphate of ammonia for nitrate of soda and the elimination of the farm manure dressing.

Variety.	J. Wylie, Turkeith.					J. J. Ryan, Kilmore.					J. Gay, Emerald.					J. Gray, Kinglake.				
	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E
Prolific (White)	..	..	..	..	..	6.0	5.2	5.2	4.2	3.1	2.2	3.4	1.5	3.4	2.4	3.7	3.5	2.7	3.3	2.2
Brown's River	2.6	2.5	2.5	2.3	3.1	4.4	5.0	4.4	5.0	4.3	3.5	3.6	2.5	3.3	2.1	2.7	2.9	1.5	2.1	1.9
Brown's River (Illowa)	..	..	..	..	..	..	..	..	..	..	3.5	4.1	2.4	3.6	2.7	..	..	..	..	..
Bismark	2.7	2.6	2.7	2.8	3.2	4.9	5.1	3.3	5.2	4.1	3.4	4.0	2.6	3.5	1.7	..	..	..	..	..
Early Rose	..	..	..	..	..	..	..	..	..	..	.7	1.2	1.1	1.1	.7	..	..	..	..	..
Copperskin	..	..	..	..	..	6.4	5.1	5.1	5.0	4.4	4.2	4.2	2.3	4.2	2.6	..	..	..	..	..
Queen of the Valley	..	..	..	..	..	..	..	..	..	..	3.5	4.0	3.4	3.4	3.2	3.0	2.7	3.5	4.1	2.8
Black Prince	3.6	3.0	2.2	2.5	3.0	6.2	4.9	5.9	7.3	5.9	4.3	4.2	2.7	5.2	2.6	2.5	2.5	1.0	2.3	1.5
Blue Prolific	..	..	..	..	..	6.4	7.0	5.3	5.2	2.6	2.7	3.3	2.3	3.7	2.6	2.7	2.5	1.4	2.4	1.5
Brown's River (Local)	2.4	2.1	2.2	2.4	2.7	..	..	..	..	..	4.6	4.4	1.9	3.7	2.1	..	..	..	..	..
Clark's Main Crop	2.5	2.4	2.0	2.4	2.1	7.2	5.9	6.2	6.4	5.0	4.5	4.4	1.2	4.2	2.6	3.7	4.7	2.4	3.0	2.1
Daniel's Sensation	..	..	..	..	..	..	..	..	..	..	3.5	3.4	1.1	6.7	2.0	..	..	..	..	..
Lynch's Green Seed	..	..	..	..	..	..	..	..	..	..	3.7	3.2	1.4	2.5	1.6	..	..	..	..	..
Lynch's Ripe Seed	..	..	..	..	..	..	..	..	..	..	3.3	2.3	1.5	2.6	1.7	..	..	..	..	..
Scotch Grey	3.6	3.4	3.6	3.4	3.4	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Bruce	4.2	3.4	2.4	3.6	2.6	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Up-to-Date	5.6	5.5	3.5	4.6	4.5	8.3	5.1	6.4	10.3	5.3	..	..	..	..	..	..	..	..	..	..
Carman No. 1	1.6	1.3	.9	.9	1.0	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
British Queen	.8	.7	.5	.5	1.1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Goodfellow	1.6	1.5	1.1	1.3	1.0	..	..	..	..	..	..	..	..	..	..	1.5	2.1	2.4	2.4	1.5
Fox's Seedling	2.5	1.7	1.7	2.1	1.7	3.5	3.5	2.4	3.3	3.0	..	..	..	..	..	3.1	3.6	2.2	3.4	2.0
Rose	1.5	.8	.8	1.2	.8	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Royal Kidney	1.7	1.2	1.1	1.2	1.2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Late Rose	..	..	..	..	..	3.4	4.9	2.2	2.2	1.6	..	..	..	..	..	..	..	..	..	..
Sutton's Abundance	..	..	..	..	..	7.5	6.9	5.4	6.3	5.5	..	..	..	..	..	..	..	..	..	..
Tasmanian Red	..	..	..	..	..	5.2	5.2	5.9	5.3	4.2	..	..	..	..	..	..	..	..	..	..
Orr's Wonder (Local)	..	..	..	..	..	9.9	5.5	5.9	10.6	7.2	..	..	..	..	..	..	..	..	..	..
Vanguard	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2.1	2.7	1.4	1.9	.7
Beauty of Hebron	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1.1	1.1	.7	1.0	.9
Duke of Rothesay	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1.3	1.4	1.0	1.5	.7
Brown's River, No. 2	..	..	..	..	..	5.2	4.5	4.3	4.4	3.5	..	..	..	..	..	..	..	..	..	..
Average	2.6	2.3	1.9	2.2	2.2	6.0	5.2	4.8	5.7	4.2	3.4	3.5	1.9	3.6	2.1	2.4	2.7	1.8	2.5	1.6

Manures used.—A. 2 cwt. Superphosphate. B. 2 cwt. Superphosphate, 1 cwt. Sulphate of Ammonia. C. No manure. D. Same as B, and 1 cwt. Potash Sulphate. E. 4 cwt. Lime.

The returns from this group of fields do not show any striking differences for various manure dressings, but they strongly emphasize the value of manuring by the production of an extra ton of potatoes per acre over ground not manured:—

	A.	B.	C.	D.	E.
Tons per acre ...	3·8 ...	3·4 ...	2·6 ...	3·5 ...	2·5

The third group of fields comprises rich volcanic soils. The manure dressings are identical with the preceding group, but the lime is replaced by farm manure in section E.

The average yields for the different sections do not show considerable variety.

	A.	B.	C.	D.	E.
Tons per acre ...	5·5	5·2 ...	5·0 ...	6.1 ...	5·3

While it is not surprising to find a yield of 5 tons per acre from unmanured ground, it is gratifying to find that even on these rich soils, *manures rationally applied can still increase the yield by over one ton per acre*, as on section D. The effect of the stable manure has also brought

about an improvement in yield, due, no doubt, to the moister condition of the soil thus treated.

Variety.	T. A. Parks, Romsey.					T. Lane, Koroit.					W. Walters, Coghill's Creek.				
	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E
Fox's Seedling	..	..	..	..	..	6.8	7.6	6.5	8.5	7.5	2.0	2.2	1.3	1.3	2.3
Daniel's Sensation	6.5	5.7	4.8	5.8	5.9	2.3	3.5	2.6	3.4	3.4	1.2	1.4	.7	1.3	1.2
Clark's Main Crop	9.7	8.8	7.5	8.9	7.4	6.9	8.7	6.9	10.3	8.0	3.4	3.3	2.0	3.9	3.0
White Prolific	8.2	7.5	6.9	8.4	6.9	5.1	6.8	6.5	7.5	5.6	2.4	3.3	1.1	2.2	1.7
British Queen	..	..	..	..	..	4.1	5.6	3.9	5.1	4.9	..	..	..	..	..
New Zealand Pink Eye ..	..	..	..	..	..	6.9	9.9	7.9	7.9	7.8	2.2	2.6	1.1	3.0	1.2
Bismark	5.6	5.8	4.4	6.8	6.7	5.7	7.0	5.6	7.5	4.9	1.7	2.0	1.3	2.1	1.4
Black Prince (subsoiled) ..	9.2	8.3	6.9	8.5	7.8	4.4	7.3	6.1	7.0	6.3	2.6	2.5	1.6	2.4	2.3
Black Prince (not subsoiled) ..	8.6	12.2	7.5	7.2	7.5	..	..	..	..	..	..	..	..	..	..
Sutton's Abundance ..	9.6	10.7	8.0	10.3	9.7	7.5	9.6	9.2	12.4	8.5	3.2	2.1	1.4	2.5	2.6
Brown's River (Warrnambool Seed)	..	..	..	..	..	5.1	6.0	6.8	7.3	5.1	..	..	..	..	..
Brown's River (Romsey Seed) ..	..	..	..	..	..	5.7	9.6	7.4	7.5	6.8	..	..	..	..	..
Brown's River (Local Seed) ..	7.0	8.7	8.2	9.2	7.4	7.0	9.7	6.1	8.8	7.6	..	..	..	..	..
Up-to-Date	10.7	10.0	8.7	10.3	9.5	10.7	11.9	10.5	12.2	10.9	3.0	3.5	1.4	2.6	2.3
Copperskin	11.1	10.1	8.3	9.7	8.9	7.3	7.9	6.8	7.5	8.0	2.5	2.3	3.1	2.5	3.4
Tasmanian Red	8.9	9.7	7.1	8.5	7.9	..	..	..	..	..	2.4	2.4	1.4	2.7	2.2
Tasmanian Red (Ordinary) ..	8.3	9.5	7.9	8.3	7.8	..	..	..	..	..	..	..	..	..	..
Tasmanian Red (Selected) ..	8.5	8.9	7.2	9.5	7.7	..	..	..	..	..	..	..	..	..	..
Brown's River (Selected) ..	7.8	7.1	5.7	7.2	6.8	..	..	..	..	..	..	..	..	..	..
Brown's River (Jellies) ..	8.3	8.7	7.7	7.9	6.9	..	..	..	..	..	2.7	2.5	1.6	2.4	2.1
Lapstone Kidney	5.1	4.9	4.9	4.1	3.4	..	..	..	..	..	1.4	1.2	.6	1.6	1.4
Up-to-Date (Local)	6.8	6.5	7.5	8.7	5.7	..	..	..	..	..	..	..	..	..	..
Carman No 1	..	..	..	..	..	..	..	..	..	..	1.6	2.1	2.0	2.6	2.6
Average	8.2	8.4	7.0	8.2	7.2	6.1	7.9	6.6	8.0	6.8	2.3	2.3	1.4	2.3	2.1

Manures used.—A. 2 cwt. Superphosphate. B. 2 cwt. Superphosphate, 1 cwt. Sulphate of Ammonia. C. No manure. D. Same as B. and 1 cwt. Potash Sulphate. E. Stable manure.

KYNETON FIELD.

Mr. Argyle, M.L.A., carried out an experiment on the following lines:—

Variety.	Mr. Argyle, M.L.A., Kyneton.				
	A	B	C	D	E
Up-to-Date	9.5	11.6	8.2	4.4	7.1
Brown's River	4.4	4.5	5.3	3.4	3.9
Cook's Favourite	9.0	6.1	9.0	10.3	8.5
Bismark	4.9	4.6	5.2	5.9	6.3
Queen of the Valley	3.7	10.4	6.4	9.0	8.0
Blue Prolific	14.6	16.4	14.6	10.4	11.7
Vanguard	6.1	5.4	5.5	5.0	6.0
Carman No. 1	4.2	4.6	3.4	3.6	4.3
Brownell's Beauty	6.5	7.0	4.5	4.7	5.3
Average	6.9	7.8	6.9	6.2	6.7

Manures used.—A. 2 cwt. Superphosphate. B. 2 cwt. Superphosphate, 1 cwt. Potash Sulphate. C. No manure. D. 4 cwt. Lime. E. Stable manure.

The yield for all sections was extremely good, the most noticeable feature being the increase of section B (superphosphate and potash sulphate) over the unmanured section C. Nearly an extra ton of potatoes per acre for an expenditure of 13s. 6d. is worth consideration, and potato growers with land of a similar class would do well to note the effects of this manurial combination. The stable manure shows need for a supplement of superphosphate.

GENERAL REVIEW.

The date of preparation of the soil, time of planting, and varieties sown, somewhat complicate the question of potato manuring. Then again

the proportion of marketable seed differs with varieties and this no doubt is influenced by the manures used, so that to make a definite statement that any particular manure or combination of manures is the best for potatoes is courting criticism.

The following digest of all potato fields, disregarding varieties of tubers sown and locality, offers some general information:—

Locality.	YIELDS PER ACRE.								
	2 cwt. Superphosphate.	2 cwt. Superphosphate. 1 cwt. Sulphate of Ammonia.	2 cwt. Superphosphate. 1 cwt. Nitrate of Soda.	No Manure.	2 cwt. Superphosphate. 1 cwt. Nitrate of Soda. 1 cwt. Potash Sulphate.	2 cwt. Superphosphate. 1 cwt. Sulphate of Ammonia. 1 cwt. Potash Sulphate.	2 cwt. Superphosphate. 1 cwt. Potash Sulphate.	5 cwt. Lime.	Farm Manure—approximate, 10 tons.
	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons
Turkeith	2.6	2.3	..	1.9	..	2.2	..	2.2	..
Kilmore .. .	6.0	5.2	..	4.8	..	5.7	..	4.2	..
Emerald . ..	3.4	3.5	..	1.9	..	3.6	..	2.1	..
Kinglake	2.4	2.7	..	1.8	..	2.5	..	1.6	..
Digger's Rest . ..	.9	..	1.3	.6	1.1	..	..	.8	1.3
Casterton	3.6	..	4.3	3.5	2.6	..	..	1.0	.8
Condah	2.8	..	3.3	2.0	3.1	..	..	2.0	1.7
Iona . .	3.0	..	3.7	2.6	3.6	..	..	3.2	5.1
Romsey	8.2	8.4	..	7.0	..	8.2	..	..	7.2
Koroit	6.1	7.9	..	6.6	..	8.0	..	..	6.8
Coghill's Creek . .	2.3	2.3	..	1.4	..	2.3	..	..	2.1
Kyneton	6.9	..	..	6.9	..	..	7.8	6.2	6.7
Average . .	4.0	4.6	3.1	3.4	2.6	4.8	7.8	2.6	3.9

It will be noted that 2 cwt. per acre of superphosphate has produced an increase of .6 tons (12 cwt.) per acre over the unmanured land. Adding 1 cwt. sulphate of ammonia to the superphosphate further increases the improved yield to 1 ton 4 cwt. per acre. The further addition of 1 cwt. of potash sulphate to the superphosphate and sulphate of ammonia shows an enhanced increase of 1 ton 8 cwt. per acre. To put the matter on a commercial basis, a dressing of 2 cwt. superphosphate, 1 cwt. sulphate of ammonia and 1 cwt. potash sulphate costing approximately 37s. 6d. per acre has produced an extra yield of 1 ton 8 cwt. of potatoes, which at £2 10s. per ton would be worth £3 10s. over and above what was produced from the unmanured land. Manuring therefore pays handsomely. The cost may seem rather high, but if potatoes were worth £5 per ton instead of £2 10s., the profit would have been double for the same expenditure in manures.

Attention might be drawn to the fact that farm manure alone has produced an increased yield of .5 tons (10 cwt.) per acre, which may be taken as evidence of the virtue of this much neglected material. Had the farm manure been supplemented by artificial fertilisers, the results would have probably been much more prominent.

The Field Branch recognises the value of these manuring trials with potatoes, but advises caution in the use of excessive dressings, which might stimulate a too abundant growth of tops to the detriment of the tubers. It is perhaps superfluous to add that the cultivation of potato land must always regulate the action of the manures.

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(*Continued from page 494.*)

IV.—THE IMPORTANCE OF TREE PLANTING.

J. M. Reed, I.S.O., Surveyor-General.

According to the returns of the Government Statist there are in the State of Victoria over forty-three thousand individual holdings of over 30 acres in extent, and when it is considered that the large majority of these land-owners are active agents for the destruction of trees it will be realized how vast a work of destruction has been and is in progress. The question naturally presents itself as to what will be the ultimate effect of this immense clearing of timber cover. Can it be continued without being productive of injury to the State? Some thoughtful observers anticipate serious disaster and point to severe climatic changes, droughts and floods as the veritable results that will follow.

It has been clearly established that by the clearing of the country the flow of streams is affected, springs disappear, and, by the rapid discharge of the rain water from the cleared surface into the watercourses, whence it passes away and is largely lost, the benefits of the actual rainfall are minimized. The experience of the countries of the Old World should afford striking object lessons. Spain, France, Italy, and Turkey may be quoted as instances. In Russia the reduced volume of the River Volga is attributed to the cutting of the timber along the valley. The very extensive and reckless forest clearing in India was found to be productive of harm, and in America, too, the clearing has been enormous and the need of planting has been realized. Australian eucalypts have been introduced into India and have done remarkably well, their rate of growth being much faster than that of the indigenous trees. Again the effects of wind action merit serious consideration. It must be admitted that effective protection from the cutting winds of winter and scorching blasts of summer can be productive only of good to the farmer, and yet how many fail to give any attention to the preservation or creation of timber screens.

The progress of settlement and the development of our agricultural and grazing industries necessarily involve the clearing of the country, and timber growth has to give place to products of various kinds. The reasonable aim should be to see how far timber cover can be preserved or promoted consistently with the demands for land for other uses. If the forty-three thousand land-owners previously referred to could be induced to become active agents for the promotion of tree growth, what a transformation would be accomplished. There are estates well known in Victoria where, largely as the result of systematic tree planting, the grazing capacity has been raised and the idea that land devoted to tree growth is so much waste is a decided fallacy. In these days of improving dairying conditions, too much attention cannot be given to stock protection, and what better protection can be afforded to stock than that furnished by well arranged plantations. It is no uncommon sight to see dairy stock in the most miserable condition, suffering the ill-effects of exposure, and how much of the loss of stock and of stock returns might be avoided by the provision of suitable cover.

Quoting from a previous paper * I take the following summary of advantages which may be claimed as the result of careful attention to tree growing.

"The improved condition of the homesteads, both as regards the personal comfort of the occupiers and the attractiveness of the home.

The improved condition of stock resulting from the comfort of the effective shelter from the extreme of heat and cold.

The increased returns from stock.

The protection of pasture lands from the drying effects of strong winds.

The protection of cultivated lands by break-winds.

The increased value of farm lands. A well planted farm is certainly the more valuable.

The ultimate assured fuel supply and timber supply for farm purposes."

Of course in different localities the conditions will be found to vary but in every district there is full justification for careful attention to this provision.

It has been written "Whenever we plant a tree we are doing what we can to make our planet a more wholesome and happier dwelling place for those who come after us, if not for ourselves." Unfortunately the time factor essential to tree production operates in the minds of many persons to deter them from planting and speedy returns from other cultivation are deemed of more importance. Victoria is a young State and the actual results of timber growth cannot be freely quoted. But even the commercial test may to some extent be applied. I have endeavoured to procure specific instances. One is furnished by the Ballarat Water Commission on whose reserved areas the *Pinus insignis*, an admirable shelter tree but generally despised as a timber tree, was extensively planted about 30 years ago, and during recent years a large quantity of timber has been disposed of. From the State plantations at Creswick, pine timber is being sold for fruit cases, and the available supply will give a very satisfactory return. On Mount Carmel Estate, Redcastle, pine planks 12 inches wide were cut from trees planted in the year 1872, and were used on farm buildings. Mr. W. Gill, Conservator of Forests in South Australia, in an official report, stated that *Pinus insignis* plantations after twenty-one years growth give a net return of £100 per acre. These figures show that from a revenue consideration tree planting is not to be lightly regarded, and, in addition, the incidental advantages of shelter, &c., are fully enjoyed during the period of growth. On some of the estates in the Western District, where extensive plantations have been formed, the actual timber value is very substantial.

A leading institution, now familiarly known as Arbor Day, is becoming more and more popular in our State, Borough and Shire Councils acting in conjunction with the Education Department in a most praiseworthy manner to promote the success of the movement. I presume in this audience there are many gentlemen who are councillors, members of Boards of Advice, and of Agricultural Societies. If all such would take an active interest in this work, and encourage the young people to become planters, the good effect throughout the State would be speedily evidenced.

* "A Plea for Tree Planting and Tree Preservation," page 707, *Journal of the Department of Agriculture*, December, 1906.

Arbor Day was originated in America, in 1872, by the Nebraska State Board of Agriculture, at the instance of Mr. J. Sterling Morton, and from its inception has been remarkably successful. Nebraska was later, by legal authority, designated the "Tree Planter's State." Throughout the United States, Arbor Day is now systematically observed, and by securing the active co-operation of the schools, colleges, and universities, a great interest in tree planting has been fostered, and a wonderful success achieved; in many States, Arbor Day is a recognised public holiday. It has been officially recorded that the inauguration of this movement by Mr. Morton, who subsequently became Secretary of Agriculture, "has done more for the protection of forests and the encouragement of tree planting than all our legislation."

I venture to suggest the introduction of the competitive system in Victoria. Would it not be an appropriate work for Agricultural Societies in their respective districts to arrange competitions, offering prizes for the best planted farms, and framing suitable conditions under which the prizes would be awarded. In the year 1883, Dr. L. L. Smith read a paper before the National Agricultural Society of Victoria, in which he pointed out the evil results likely to follow the wholesale destruction of timber, and submitted a very ambitious proposal to provide a large fund by subscriptions from all classes for the purpose of giving very generous prizes for the best tree plantations. His proposal, however, met with very little encouragement or support, though consistent planting has been undertaken by many land-owners. In the United States, practical effect has been given to the idea of competitive planting. Valuable prizes are offered for the planting of certain varieties of trees. Australian eucalypts, particularly the blue gum, are extensively planted in California, and the State laws of Illonois, Missouri, and Iowa, specially encourage tree planting.

Again, the scrupulous protection of trees growing on country roads is worthy of the attention of Municipal Councils, and I commend to the notice of councillors present, the action of a certain Shire Council, which, having decided by a majority vote, to sell for milling purposes, the fine red gum trees growing on country roads, resolved, on the remonstrance of the Lands Department, not to permit any trees to be removed, unless to meet the requirements of traffic. Many years ago, in the State of California, the County Boards were empowered to authorize land-owners to plant trees of specified varieties on the public highways, and, after four years, if conditions as to spacing, distance from road formation, and satisfactory growth were certified to as having been complied with, a payment of one dollar per tree could be made. This is in marked contrast to our Victorian experience, where the trees on so many of our public roads are ruthlessly sacrificed to the greed of the land-owner, by whom a more or less scanty growth near his boundary line is regarded as full justification for secret ring-barking.

The clearing of river reserves, particularly in our northern districts, should be discouraged in every possible way. Be it always remembered that a well-grown tree represents nature's work of many years, and to needlessly destroy such a work is utterly wrong. This clearing of reserves is a distinct illegality, and treated as such.

The notes prepared, at my request, by Mr. Johnstone, officer in charge of State Plantations, at Creswick, were published with my previous paper, and are well worthy of careful perusal, as they indicate what, when, and where to plant, and are the opinions of an expert. A farmer

who begins to plant either by sowing broadcast on well prepared land, or by forming propagating beds, will very speedily develop an interest in such work, and experience a great satisfaction in looking after the seedlings, and then seeing the good results that will so soon follow his well-directed efforts. One tree that is finding special favour in Victoria, merits particular notice. The sugar gum, pronounced to be a fair timber tree, is the most rapid grower of all the eucalypts, has a very fine foliage, makes a good clean trunk if allowed to run up, and if cut back in its early growth, forms an excellent shade tree, and grows well in almost any situation. It seems to be particularly adapted to the northern districts, where, with the well-known pepper tree, it can be safely planted.

The opinion of planters in the dry northern districts has been sought. Mr. William McNab, of Corack East, after twelve years' experience, is well satisfied with his results, and considers the sugar gum takes first place. His trees are 30 feet high, seem to resist white ants, provide effective break-winds, and already supply valuable material by thinning. His method of planting is by broadcasting seed on well fallowed and carefully prepared ground. The fallowing gives the young plants a good start, and enables them to survive the dry season during early growth. Mr. O. H. Roediger, of Lorquon, confirms this opinion, but he raises his plants in seed beds, hardens them off in early spring, and plants in September, on well-prepared fallowed ground, taking the further precaution to make with a crowbar, a hole, which, when filled with sandy loam, leads the tap root down into the sub-soil. These methods have given excellent results, and should encourage growers, even in the very dry areas, where shelter would be most valuable, to make the attempt.

In the matter of the cost of tree planting, no difficulty presents itself. Seed can be obtained from Melbourne seed merchants, at the low price of 2s. 6d. per ounce, and the labour of sowing and protecting the plantations represents a very small outlay. With such manifest advantages to be derived from thoroughly systematic tree planting, of benefit both to the grower and the general community, it should not be necessary to urge our land-owners to undertake the work. It is hoped that the few notes now submitted will be productive of good results and influence some, at least, to take a keener interest in the subject, and become earnest planters.

V.—PORK RAISING FOR EXPORT.

W. Smith, Pig Expert.

The importance of bringing the matter of pork-raising for export under the notice of the farmers of Victoria has, for some time past, occupied the attention of the Department of Agriculture, whose desire is to give every facility to those who will interest themselves to make this special line of trade with other countries a success. The Department deserves the thanks of the community for the assistance it is rendering. I see no reason why Victoria should not export pork in very large quantities, and raise proportionally as large numbers of pigs as do the United States of America. I say proportionally, for, of course, Victoria does not contain as much territory or population as the United States; but she compares very favorably with that country, for the quality of the soil is, on the average, better than in the United States. Under the terms of my appointment, I will visit the various districts

and assist the growers with my experience, deliver lectures, and give all the information in my power to forward this particular branch of trade, and thus enable the farmers to realize the grand prospects there are of making the industry of pork-raising for export a profitable business.

SOME STATISTICS.

The following statistics will give you some idea of the enormous volume of trade done in the United States of America in connexion with the pig-breeding industry:—"The number of pigs packed in the Western States during the year ended 1st March, 1907, was 25,430,000, or 145,000 less than the maximum attained in 1905-6. The marvellous growth of this industry is shown by the fact that the number did not reach 5,000,000 in any year prior to 1872-3, while it was only a little over 9,000,000 as recently as 1882-3, and it was not until 1897-8 that a total of 20,000,000 was reached. The money paid for the Western pigs in 1906-7 amounted to 361,840,000 dols. (£75,483,000), being the greatest sum on record. Including an estimate for the Eastern States, the total value of the pigs sold is 433,840,000 dols., or £90,383,300. Higher prices were paid for the pigs during the past year than in the previous twelve months, for though the number was slightly less the value was greater by 66,353,000 dols. The average price in the West last year was 6.36 dols. per 100 lbs. live weight, as compared with 5.33 dols. for the previous twelve months. The quantity of green meat from the 25,430,000 pigs of last year was 3,175,955,000 lbs., and that of lard 824,442,000 lbs."

OVERSEA MARKETS.

This will give you some idea of the possibilities of growth in this trade, and I unhesitatingly affirm that Victoria will not only hold its own with the United States proportionately (taking the difference in the size and population of the two countries into account) but that our little country will produce more pigs and establish a name for our produce, which will be of wide-world fame, and profitable for all. This statement is borne out by the fact of the superiority of our soils, and the consequent greater producing capabilities of our land, backed up by a genial climate unparalleled on the face of the earth. We suffer none of the excesses of climate other lands are subject to. We are not snowed up in winter nor prostrated by heat in summer. We are favoured by genial weather, and everything is conducive to health in both man and beast. Hence, it is apparent to any level-headed man that Victoria is an ideal place, capable of breeding and raising hundreds and thousands of pigs annually, and to do so profitably to the farmer and enable him with fair freights and charges, to compete with any country in the world's markets. And see what a field there is for our products! Africa, India, China, Japan, the Continent of Europe, and England, who now take our wool, grain, beef, mutton, butter, and who will only be too glad to take our frozen pork also. Shipments have already been sent with profitable results, and it is evident it only requires the farmers of this State to go into the pork-raising industry with vigour to make the trade a brilliant success.

SLOW PROGRESS.

At the present time Victoria is just in the same position as she was thirty-five years ago in regard to the pork-raising industry. Quoting from the *Australian Meat Trades Review*, I find that as far back as 1871 there

were 180,000 pigs in Victoria. These figures rose to 240,000 in 1881, 282,000 in 1891, and 350,000 in 1901, but have now dropped back again to 220,000, the falling off being undoubtedly due to the fact that farmers have had to rely almost entirely on the local and Inter-State markets, but now that there are standing orders for any quantity of fresh pork at 4d. per lb., dressed weight, advertised in Melbourne, Portland, and other freezing centres, there is no reason why the pig business should not assume very large proportions.

I would like to point out some of the many advantages attached to the rearing of pigs. Increasing numbers are beginning to find out these advantages. For instance, in Colorado, Wyoming, and Montana, cattle-raising was the only industry for many years. Then the country was invaded by sheep-farmers, as it was found the sheep yielded more profit than the cow. But now a new departure is taking place in the States named, for the pig is proving that he yields a higher profit than the sheep. As we all know, it is necessary to grow peas, beans, and barley for the satisfactory feeding of pigs, and the fact that peas and beans extract nitrogen from the air, and transfer it to the soil, gives these crops a special value to the farmer, for they enable him to maintain the fertility of his land without being put to the expense of buying nitrogenous manures. And in regard to inferior or discoloured grain; this, which is so often sold at a sacrifice, could be better utilized on the farm for pig-feeding, thereby saving cost of carriage. Besides, the benefit derived to the land by way of manure in allowing the pigs to feed on such grain is considerable. Then again, the spare time of the farm-hands can be utilized in the regular feeding of the pigs, cutting bedding, cleaning styes, &c. In fact, the pig pays for his own board and lodgings right handsomely, and he is a really valuable adjunct to the butter industry, in so far as the disposal of skim milk is concerned. Skim milk, properly treated by fermentation, and mixed with pollard, is a most satisfying and fattening food.

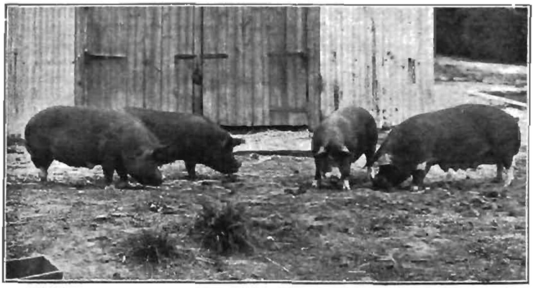
THE BEST BREED.

There are many breeds of pigs, but the Berkshire stands boldly out, being remarkable for conspicuous features, and having been thoroughly tried, his suitability for this country is beyond question. I cannot speak in too laudatory terms of this magnificent animal, his leading characteristic being to fatten quickly, aye, quicker than any other, that is, to be ready for market. He is also more prolific, whilst taking less food, and is held high in the estimation, not only of the breeders, but, owing to his shapely conformation and thick flesh, of the butchers and bacon-curers also in this and every other State of the Commonwealth. The Berkshire stands at the head of all breeds, not only for consumption in this country, but for export, and hence he is the most remunerative to the farmer.

In mating the pig, get good half to three-quarter bred sows. Mate these with young, pure-bred boars. In picking your sows, let them be at least ten months old; the boars to be of the same age. You will then have the prime of their lives. See that the sows have at least twelve teats. They should not be allowed to get too fat during the time of gestation, and this may be avoided by restricting their food somewhat. In choosing your boar, see that you get one with good constitutional vigour, breadth of chest, width of loin, chine and ribs also good width, depth of carcass and beauty of form; head not too long, dished face,

fine snout, full cheeks, the ribs, loin and rump of uniform breadth, back straight, chest deep, broad and prominent, ribs well set and *springing well from the chine; shoulders widely extended and thighs* inside and out very thick; short legs, the bones of which must be fine and the joints small; skin thin and supple, without looseness; fine soft hair, which is an indication of sound constitution. Keep this description in your mind, get the boar as near to it as possible, and you will have the ideal Berkshire.

The breed of the boar is of more importance than that of the sow, as the progeny take more after the male than the female. Bear in mind that both boar and sow will be in condition for breeding purposes at ten months. If used earlier, the generative powers of both will become deteriorated. Gestation lasts sixteen weeks—112 to 114 days—and it is therefore advisable to mate them so that the sows will have their litters in time to meet with good markets. The height of summer or the depth of winter, should be avoided in the littering of sows. The sow may be



BERKSHIRE BROOD SOWS.

allowed to run about with other pigs up to ten days or a fortnight of parturition. Then pen in comfortable sty, and feed her on soft food. Make her bed of short straw or leaves, but not too much, lest she smother her young by lying on them. Always remember that if the parents are kept healthy, they will transmit health to their offspring, and by breeding your stores, you are using every precaution against disease from outside.

Castrate the young pigs when three weeks old. They can be weaned at eight weeks. Feed them three times a day with warm food, such as skim-milk, butter-milk, whey, &c., and in about a week they will take the ordinary food with the others. They thrive best when fed with regularity. A sow will continue to be prolific for five or six years, and cases are known where they have been so for eight years. It is therefore, wise to keep a good breeding sow as long as possible, that is, if she is a good mother as well, for young pigs often prove poor mothers.

Uniformity in Feeding and Breeding.

No class of stock pays better than pigs, if well looked after, and great saving is affected by constant attention. Pigs can be fed econo-

mically on a good deal of waste stuff often regarded as rubbish. Frequently food is thrown to them all at once, and they waste more than they eat, when, if only a small portion was tossed over at regular intervals, the extra labour incurred would be more than compensated by the saving effected. By regularity in feeding, the pigs are contentedly employed during the day, and a placid temperament is thereby encouraged in them. By an established export trade, the price of porkers and baconers would be steadier the year around, whilst the quality of the pigs sent to market would be of a higher standard of excellence, for most farmers would feed their pigs similarly, and hence they would command an equal and more certain market on which the producer could rely, that is, for those sold to Victorian consumers. It would then be patent to the producer to breed and feed pigs of the right sort only, the day of the mongrel-bred animal would be a thing of the past, and the pig-breeding industry would be an object-lesson to those who have well-bred and good milking cows, but are satisfied with any sort of a bull.

BERKSHIRE BACONERS.

Best Feed.—In order to obtain food for the pigs, plant such crops as your land will best produce. Pumpkins, turnips, carrots, melons, sugar-beet, grain (not forgetting peas) are the best to grow. And in regard to the latter especially, you will find no way of securing better returns from your land, for the growing of peas not only cleans the land, but takes little out of it. Yes, as I have said before, fattening pigs is a money-making venture. For instance, take a sow at ten months old. In two years she will produce five litters of an average, of, say, eight pigs a litter. Keep them on your farm, fatten them, and when fit send to market, and you can rely on her returning you a gross £40 or more a year. Is this not a grand return? If you retain the young pigs until they become baconers, the result will be equally good, for taking the ordinary rate of improvement, the pig will go on increasing in weight until he reaches 120 or 160 lb., at which weight he is most in demand by Victorian bacon-curers. Above all things you must go about the fattening process in a systematic manner. Don't start before you are ready. Grow such foods for them as will best suit, and provide such accommodation as is absolutely necessary. Then the result will be satisfactory. Of course there are many swamp lands in Gippsland where pigs thrive without artificial

food, and when penned up at the right age as stores, and fed with good food ripen rapidly. But every one is not possessed of such places, and my remarks are directed to those who have land and soil that can grow root and grain crops. To these, I say, the most profitable animal you can rear is the pig.

Let me warn you against feeding pigs on clover and some of the grasses. For argument sake, suppose you have a dozen pigs or so, half or three-part fat, which have been running out on the clover. Then put them in the sty, top them up with the very best food, be it grey peas, milk, or any other equally good, and what will be the result? I will tell you. They will turn out as fishy as if they had been fed on shark meat! The proper thing to do in such a case is to let the pigs go back to poor stores, then top up, and the new meat thus made will be all right. Don't imagine you can hoodwink the bacon-curer. He knows his way about, and if he finds you have put in a few fishy ones, he will say nothing, but will wait, and when your next draft comes to hand, you will know all about it by the returns you get. In Warrnambool years ago, it was usual to keep the pigs on the clover as long as they were thriving, and then top off, but they never brought prices equal to or approaching what reliable farm-fed pigs brought, for the reason I have given. If you have maize, which is a good fodder, be sure and mix it with other foods (peas, &c.), and don't feed them on maize alone, for if you do the bacon won't keep. It goes rusty very quickly, and eventually finds its way to the auction rooms. Pig-breeding is not carried on here in a proper manner. Take your cue from the United States of America, and you are on the right track.

Weights to Breed.—Coming to actual requirements, as far as weight is concerned, those most in demand for either export or home consumption are pigs which range in weight from 60 to 80 lb. dead weight, for pork, and from 120 to 140 lb. for bacon, for Victoria, and from 80 to 100 lb. for bacon for export, quality being, of course, a great desideratum. In some instances as high a weight as 160 lb. is permissible in Victoria. For export, pigs to 100 lb. can be taken, and I have authority for saying that shippers will establish a definite rate per lb. for all pigs properly slaughtered in Melbourne, and delivered at the freezing chambers, that is, of course, if farmers will study their own interests, and go in whole-souled for breeding, not only to meet Victorian requirements, but for export as well. There should be no apathy shown, and my efforts have been brought into requisition for your special benefit. Owners of outlying lands and properties situated far from railway stations, where carriage of produce is heavy, will find the fattening of pigs a money-making venture, for the pig will fatten on the produce and carry it to the market himself, and this especially applies when the produce is in any way discoloured, and the price for same not what it might be, and all should bear in mind that the cost of carriage of any class of produce is always an expensive item.

DONT'S FOR PIG BREEDERS.

Up to this point I have mainly been telling you what you should do in regard to the breeding of pigs. Now to conclude with a few "dont's." Some of these "dont's" I have touched on already, but they will bear repeating.

Don't give the pigs skim-milk fresh from the separator. It is aerated, and acts deleteriously to young ones especially. Let it remain until next day.

Don't give the liquor in which potatoes are boiled to the pigs. If you do they will never fatten. The tannin destroys the lining of the stomach.

Don't keep pigs in confined places up to their bellies in mud. They are not dirty in their habits except you make them so.

Don't feed your pigs solely on maize, as pigs so fed do not command the prices that peas-fed pigs do. The bacon from maize-fed pigs rapidly turns rusty, and the curer cannot stock it.

Don't send discoloured grain away; it will pay you better to give it to the pig, and let him do the carting.

Don't discard pea-straw, cavings, or any straw stuff that will do for bedding. It will give comfort to the pig, and ultimately make good manure for the farm.

Don't breed bad stock.

Don't forget to feed the pigs regularly, and, finally,

Don't forget that, by following out what you have heard to-day, you are doing something for your country, not only by improving the breed of stock, but by bringing Victoria prominently before the commercial world, and doing something for which your sons will thank you in time to come.

VI.—SOME LAW (AS IT MORE PARTICULARLY AFFECTS FARMERS).

J. Weldon Power, Horsham.

I have been asked by our President to deal with two branches of the Law as it affects farmers, viz., Fencing and Travelling Stock.* Before going further I wish to distinctly state that this paper must not be regarded as a treatise, even as far as it goes, upon the law involved, but is intended to explain the operation of such law to my present audience in general terms, and without anything like the accuracy of language or of statement of propositions demanded in a treatise.

FENCING.

The law relating to fencing is two-fold in character. First, the Common Law, which for our purpose is to be gathered from the decisions of the Courts in many disputes over fencing and boundary questions, and, second, the Statute Law, which is to be found in *The Fences Act* 1890. Fortunately or unfortunately, it depends entirely on the point of view from which you look at it, the framers of The Fences Act—which comes down to us from only 1874—have allowed the great bulk of the Common Law to still remain applicable to fencing. This side of the question, however, mainly affects the rights of a land owner to call to his aid the provisions of the Fences Act so as to compel his adjoining owner to fence, and the consequences flowing from neglect by an adjoining owner to maintain fencing which he ought to maintain. Under this Common Law it is quite possible for certain lands to become and remain burthened with an obligation on the part of the owners and occupiers thereof to fence, or rather maintain fencing, for the benefit of the adjoining land. In fact, notwithstanding that the Fences Act in practically the same form in which

*Owing to want of space the portion relating to Travelling Stock has been held over until a subsequent issue.—Editor.

it now stands has been Statute Law since 1874, the great bulk of the fencing since selection began in 1869 has been erected outside its provisions. For practical purposes it has, in the vast majority of cases, remained a dead letter except in so far as that by fixing certain minimum standards of fencing, it has operated as a sort of coercive measure under threat of resort to which, an owner has been able to induce his adjoining owner to agree to fence up to these minimum standards. The underlying principle of the Act differentiating it from the Common Law has, however, not caught on. This principle is that under the Fences Act, fences for their whole length become, so to speak, the joint property of the adjoining owners, whereas under the older system, each adjoining owner owns a certain portion of the fence, subject to certain rights in the other to have the fence maintained.

To illustrate what I mean:—Suppose A and B each own selections divided by a boundary running east and west 1 mile long. If they resort to the Fences Act and put up a fence under its provisions, then the whole line is assumed to be done by them both jointly for the common benefit, not half each. That is, either a contract is let to a fencer and they each pay half, or they each provide half the materials and labour and do the work either themselves or with hired labour. True they may divide the work and each put up a portion, but the fence all the same remains a common fence, each being liable for half cost of repairs whether in the portion put up by him or not. That is a fence under the Fences Act.

If instead of resorting to the Act they come to an understanding and agree to a kind of fence and A agrees to put up and maintain the fence on the west half, and B that on the east half, then there is an agreement under the Common Law with these results.—First, A's land acquires what has been termed a "Spurious Easement" over B's land, that for the future the owners of B's land adjoining B's east half of the fencing shall be bound to maintain B's half of the fencing, and in turn A's land becomes subject to the same sort of "Spurious Easement" in favour of B's land, for the west half of the fencing. Then suppose B sells the west half of his selection to C, and the east half to D. As regards the fencing, what will happen will be this,—C, as the new owner of the west half of B's selection, is not only not under any obligation to maintain half of the original west half, but is entitled to insist that A shall maintain the full length of such half. Further, D cannot call on A to maintain any portion of the east half,—that was B's original liability, but D must, at the risk of consequences later referred to, maintain the east half for its full length. This does not work any hardship on A so far; he has to maintain one original half, and gets maintained the other original held. But according to the ideas of most people, it is pretty rough on D, who has to maintain the full boundary between him and A without contribution from A. Next, if A sells the west half of his selection to E, E will find that he will have to maintain the full boundary line between him and C. This state of affairs is not generally known, but it crops up now and again, to the great annoyance of purchasers of land who find out after they have bought that the whole burthen of maintaining certain lines of fencing falls on them.

Broadly speaking, if an owner is under obligation to maintain a particular line of fencing and allows it to become out of repair, the suffering adjoining owner cannot fetch him under the Fences Act to compel him to repair, for the reason that the machinery provided only deals with the joint fencing as referred to above. The suffering owner, though entitled under the original fencing agreement to the "Spurious Easement" giving

him the right to compel the defaulter to maintain the fence, can only resort to the summary provisions of the Fences Act at the cost of abandoning the Easement and himself accepting for the future the burthen of half the defaulter's line, while he may himself be subject to a "'Spurious Easement" to fence the remainder of the original line. He may, however, resort to the County Court to enforce the original agreement, but it would be better for him, nine times out of ten, to repair the whole line and say nothing more about it. The defaulter, however, incurs some disadvantages. If the adjoining owner's stock accidentally trespass on the defaulter's land through the defaulter's defective fencing, then, generally speaking, the *defaulter may not impound, nor may he recover damages for tresspass.* And further, if owing to getting caught in the broken wiring of the defaulter's fence the adjoining owner's horse gets his leg or his neck broken, the defaulter will most likely be answerable in damages, particularly if the adjoining owner had directed the defaulter's attention to the defective fencing and requested repairs and these were not effected within reasonable time. But that way lies litigation, a worse evil under the circumstances than the loss entailed by keeping the neighbour's fence in repair.

This, that I call the Common Law relating to fences, affects parties every time they mutually agree to divide a line of fencing between them *and to erect and repair each "his half," and do in fact erect each his* half. The question whether such agreement must be in writing naturally arises. The safest answer for you is, it ought to be, and take it from me as good advice, don't put a post in the ground till you have the other man's signature to the agreement. But if a verbal agreement has been acted on and the fencing has been put up by both parties, the necessity of writing to evidence the agreement is done away with. It then becomes a question merely of proving that there was an agreement made. If you had obtained and kept the writing, your proof would be ready to your hand; but without it you may have to rely on witnesses. But when land has changed hands many times what happens? Well, a great deal of uncertainty, but the *old Common Law still applies if either you or the other man can prove* the original agreement. The fact that it is difficult of proof only adds to the uncertainty. It becomes a question of evidence. If it can be shown that for a long period of years one adjoining owner kept a certain length of fencing in repair, then an agreement will—probably—be inferred that he or his predecessors in title agreed to do so and the Common Law, not the Fences Act, will rule—particularly if it can be shown that the other adjoining owner kept a corresponding other length in repair.

Turning now for a moment to the Fences Act. The policy of this Act as a whole is opposed to the principle underlying the practice ruling under the Common Law. There the idea is to divide the fencing into *lengths, and each man to be responsible for his own length, but giving* to the other the benefit of the right to have that length maintained as effective fencing free of cost to him. Under the Act the full line of fence is treated as a whole. It is to be erected at the joint cost of the adjoining owners, and all repairs are to be effected at the joint cost even though, as I have said above, each party for mutual convenience erects a portion. For instance, if a wire gets broken, section 17 has to be called into operation. A formal notice has to be served and both parties have to meet on each side of the fence, agree how it is to be repaired, and in solemn form do the job. I may say right here that the fact that this section has not provoked endless litigation is no credit to the draftsman who conceived it. *The infrequency of such litigation may be testimony to the neigh-*

bourly fair-dealing of farmers generally, but more probably it is evidence of that deserved, but what most certainly ought to be unwarranted, dread of the law which makes a man put up with heaps of annoyance rather than resort to its aid. If this paper reaches print, I will have part of this section set out as a foot-note and invite any farmer, who may fancy his ability to handle the simple looking proposition set him by the draftsman of preparing a notice under it, to prepare such a notice as will support proceedings under the section if the other man chooses to evade his obligations.* Common sense suggests that the notice should appoint a time, but the section does not so empower, and what is to prevent the other man from actually going, and later saying he went, to the fence several times within the week ready and willing to assist, but the "Noticer" was not on hand?

The main difficulties that face a man when he desires to resort to the Act to compel a neighbour to fence are, first of all, to be sure that a Common Law agreement does not already rule, and second, to be sure as to whether it is a question of construction of a new fence or of repairing an old one. I have already explained how an old agreement may affect his land as a "Spurious Easement." Now to illustrate these difficulties. Take a line already fenced, but the fence on which is, to a man who likes good fencing, "dead to the world." You may serve a notice requiring your adjoining owner to erect a new fence. You may get an order of Justices prescribing the kind of fence and directing how it is to be erected, and relying on such order you may erect the fence, the adjoining owner lying low all the time and saying and doing nothing. Then, when you take proceedings to recover half the cost, you may be met with either or both of these practicable defences,—1st, That you were bound under an old agreement by former owners to fence the line yourself; 2nd, That the fence already there should have been repaired and did not require a new fence. Further, you may be met with a variety of technical defences in the way of faulty notices, &c. If you have not retained a solicitor you are bound to have made some error in procedure that will knock you out. If you have retained a competent solicitor, then nine times out of ten you will never get as far as sueing, as your solicitor will have shown you so many difficulties and uncertainties that you will have decided to have put up with the loss and not risk proceedings. To show how the second defence above indicated may defeat a just claim,—Take the case of a post and rail fence many years old, fortified in places with old No. 6 wire—as so many of them are, and in other places with No. 8, and with from 50 to 70 per cent. of the posts rotten and a large percentage of the rails past efficient service. Well, here are the relevant sections:—Section 5—"*The occupiers of adjoining land not divided by a sufficient fence shall be liable to join in or contribute to the construction of a dividing fence between such lands in equal proportions.*" By the way, "a sufficient fence" means there, a fence up to one of the standards fixed by the Act as to which I will speak later. Now, Sec. 16—"*When any dividing fence made or to be made shall be out of repair or become insufficient, the occupiers of land*

* Section 17. The occupier of any land separated from any adjoining land by a dividing fence may serve a notice upon the occupier* of such adjoining land requiring him to assist in repairing such fence and if such occupier shall refuse or neglect for the space of one week after the service of such notice to assist in repairing such fence it shall be lawful for such first-mentioned occupier to repair such fence and to demand and recover from such other occupier half the cost of repairing the same . . . . . &c.

* Occupier includes "owner."

on either side thereof shall be liable to the cost of repairing such fence in equal proportions." Next study Sec. 4, Sub-sec. 1, defining post and rail standard,—" *A post and rail fence at least 3 ft. 6 in. in height of substantial material firmly erected. . . . &c."* The old fence in question is clearly not now of "substantial material," though it may have been, nor is it "firmly erected" because a large percentage of the posts is rotted through, mortises split, and rails wasted and broken. Therefore it is apparently not "a sufficient fence," and you are entitled to a new one. But hold on, it is not a fence "out of repair," or a fence "become insufficient." If it should be either of these, then, no new fence, it is a question of repairs. Make up your mind which it is, but remember the thing that cuts the ice is, not what you think or your friends think, but what the Court thinks after the other man and a "sufficient" solicitor shall have had a go. As the Statute stands the better opinion would be that it is a case for repairs. Remember, however, another most unsatisfactory state of affairs under this Act, you cannot compel a man to put up an efficient *post and wire* fence. The relevant Sub-sec. of Sec. 4 is,—" *A substantial wire fence at least 3 ft. 6 in. in height having wires tightly stretched with no greater distance between each of the three lowest wires or the bottom wire and the ground than 6 inches and the posts. . . . &c."* Well how do you measure the height,—to the top of the posts or to the top wire? The posts are as much part of the fence as the wire. Well, suppose it is the wire, then you only need four wires to comply with the Act. The section speaks of three, and you give in another to make a top wire so as to have the height of the fence capable of definition. If a man be reduced to the choice of continually tinkering an old post and rail fence or putting up a new four wire fence, the Act is not of much use to him. It leaves him at the mercy of a neighbour who may be a waster or a captious crank. Scores of times I have had to tell clients to go and do the job single handed or make some sort of a compromise in favour of the other man. This weakness in the Act as regards the specification for a wire fence renders the whole construction clauses, even where not blocked by Common Law Agreements, quite useless. The only practicable fence now-a-days is a post and wire fence, and if you cannot get a sheep-proof post and wire fence under the Act, what is the good of the Act to you? Other forms of fences which might be sheep-proof would amount to more for your half of the line than the whole cost of the post and wire for the full length of the line. This, then, being the present unsatisfactory position of the law relating to Fences, what is to be done? The thing to do is to cast the law into such shape as that people may resort to its aid without fear as to its cost, and with certainty as to that aid if the case be just and reasonable.

To do this entails—1. Giving certainty as to the existence or non-existence of fencing agreements, that is, easements under the Common Law.

2. To face and decide the proposition whether such agreements or easements shall run with the land so as to affect subsequent purchasers or fall to the ground as against such subsequent purchasers.

3. To make the Fences Act available to compel new fencing or repairs according as the above proposition may be decided, and with certainty as to whether it shall be a new fence or a repair job.

4. To recognise and make the Fences Act suit the almost universal practice as regards country lands any way, whereby adjoining owners have divided the line into lengths, each taking a portion and being more or less responsible for the maintenance of that portion.

5. To bring the minimum standards of the various kinds of fencing allowable up to date.

To take these in detail. The second proposition, if decided one way disposes of the first. If the bull be taken by the horns and it be decided, no matter what agreements may affect lands as easements, such agreements and easements shall be abolished, and that adjoining owners for the time being must erect and repair dividing fences in equal shares, the main difficulty now and in the future will be got over. In my judgment it would be best to take the bull by the horns. If not, then the first proposition must be faced. How is a man to know what easements affect? There is only one way and that is by having same noted on the title in the same way as a mortgage; and if it be not there, then no easement. To work this out would involve some such process as this:—

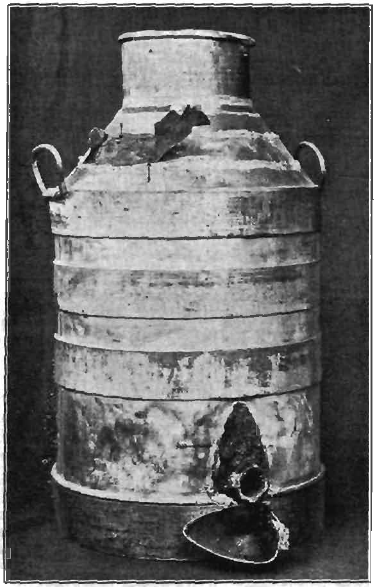
First, an owner desiring to have his fencing business placed on a business footing, would serve notice on his adjoining owners, specifying his idea of any existing allocation of fencing lengths and easements; or, if there be no such allocation, then specifying a proposed allocation. Then, if the adjoining owners do not within a limited time reply objecting, the first man or the objectors—when served with notice—may take out a summons before a magistrate to have the point decided. The magistrate would make an order, and this order would become a record of the arrangement and would be filed in the Titles Office and be noted against the affected titles. On the titles would be marked the portion of the boundaries allotted to each. A time should be allowed for the Act to be brought into operation—say 12 months or two years. In all cases not taken in hand during that period the Act would declare that no easements shall be taken or be allowed to exist binding on subsequent owners without express notice of them. Having regard to the large amount of trouble that would be entailed by this process, and to the fact that, for all practical purposes in the great majority of cases, adjoining owners have accepted the position that each adjoining owner for the time being is bound to fence or contribute to the cost of fencing half the actual lines separating them, irrespective of the fact that before a new adjoining owner bought, the whole of the boundary of what he bought formed the half of an original fence that the former adjoining owner used to repair, I do not think that the game would be worth the candle. I do not know if I make this clear. Take the two sections already referred to. A had the west half of the fence; B the east half. When B sold the west half of his selection to C, C became A's adjoining owner along the whole of the west half of the fence that A used to repair. Invariably in my experience C assumed that he had to fence half of the line between him and A, though as a matter of fact C's land had an easement over A's which would entitle C to compel A to keep the whole of the boundary fenced.

Assuming, then, that the Law would be that adjoining owners for the time being must fence and repair, and that agreements cease when a man sells his land, and that the Act will rule in every case between the original adjoining owner and the new owner, subject to any agreement they may then make to continue during their several ownerships, the position is reduced to a simple one, viz., to frame legislation to place the fencing relations of adjoining owners on a simple and easily worked footing. The shortest way to explain how this can be done would be to draft an Act for the purpose. To do so before you get the support of the Minister for a scheme of amendment would be work thrown away, apart from the fact that there is a proper official whose duty it is to attend to such matters.

The Convention Papers will be continued in the October number.

INSANITARY MILK CANS.

The accompanying illustration of a milk can is published to draw pointed attention to a prominent defect in the manufacture of most milk cans. The taps are usually as in this case soldered on to the taphole and supported by a metal flange which is also soldered round its border. If the soldering is imperfectly done, as it often is, the milk percolates into the space between the flange and can, and there putrefies. The dark



surface shown above the taphole in the illustration represents a mass of oozy, stinking, putrescent and partly solidified milk; and the hole in the can giving access to it was large enough to insure milk passing into the cavity and leaving the putrid surface whenever the can held milk. There was thus a continuous means of contaminating every bulk of milk held in the can. Taps should be screwed into a threaded brass taphole so that they may be removed and washed when the can is being cleansed.—S.S.C.

THE ORCHARD.

James Lang, Harcourt.

General rains having fallen during the past month, the ground is now in good condition to facilitate operations in the orchard. Where peas have been sown for green manuring they should be ploughed under as soon as they are in bloom. In the event of the weather setting in dry the ploughing in should be done at once, as it is very difficult to make a good job when the ground gets hard; this applies more especially to those districts north of the Dividing Range, where dry weather sets in fairly early. To choose the right time for this work the orchardist must, generally speaking, be guided by prevailing weather conditions in his district.

Where it is intended to apply artificial manure to the orchard, it should be done just before ploughing. Attention is again drawn to the table of manure values published in the February number of the *Journal*. By consulting this orchardists can always obtain the best value for their money in the purchase of manures; regard should be given to the quantity of potash contained in the orchard manures offered for sale—a larger percentage of potash would be an improvement.

Pruning should be finished early in the month, even in the latest districts. Planting also should be completed. It is better to defer planting till next season than plant too late, for the trees as a rule do not establish themselves before the dry weather sets in, and cannot therefore make a satisfactory growth unless well looked after in the way of watering and mulching.

Grafting should also be done this month. Any old trees of unsuitable varieties should be headed back and regrafted with a variety more suitable to present market requirements; this should not be neglected, as there is no profit in growing fruits that will only realize a low price in the market.

Spraying will occupy a good deal of time during the month. Where red oil or crude petroleum is being used, do not apply them after the buds burst, or great injury will be done to the trees; these are winter sprays and should not be used during spring or summer. Spraying with Bordeaux mixture for Black Spot (*fusicladium dentriticum*) will also require attention towards the end of the month; the spray should be applied just when the trees are bursting into bloom. The Black Spot has been more than usually prevalent during the past season, and has appeared in some districts which have been free from it for many years. No time therefore should be lost in checking its spread. Where the Black Aphis has put in an appearance peach trees will need spraying. Kerosene emulsion and tobacco wash are the best remedies to keep this pest in check. For curl in the leaf, spray with Bordeaux mixture as soon as it appears. Bordeaux is also the best remedy for the shothole in the apricot and should be applied just when the buds are bursting.

Citrus fruits may be planted, and they will do better now than if put in during the winter.

Strawberry beds may still be formed; there will be less trouble with weeds now, but fruit during the first season will be very little.

THE JOURNAL

OF

The Department of Agriculture.

Vol. V. Part 10. 8th October, 1907.

THE MELBOURNE ROYAL AGRICULTURAL SHOW.

A. T. Sharp, Assistant Editor.

The Melbourne Royal Agricultural Show is the great annual gathering ground of the agriculturalists of the Commonwealth. Old acquaintanceships are renewed, experiences are exchanged, and one and all obtain a greater insight into the many branches of agriculture. As on previous occasions, every effort was made by the Council of the Royal Society to

60 TON SILO ERECTED BY THE DEPARTMENT OF AGRICULTURE.

meet the convenience and comfort of both exhibitors and sightseers. With the exception of the gales which blew on the Thursday and Friday, satisfactory weather conditions were experienced, and the public fully availed themselves of the opportunity afforded of seeing the best collection of stock, machinery, implements, etc., yet exhibited in the Southern Hemisphere. The Show was open for five days, and the attendances totalled

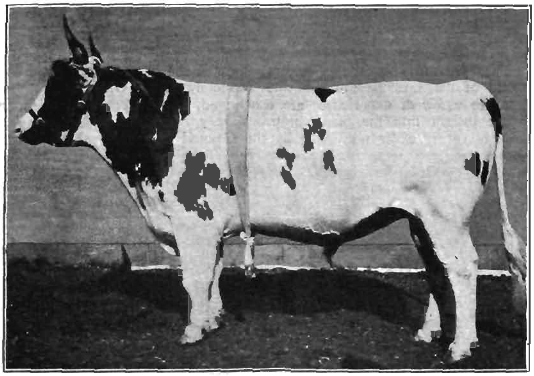
no less than 125,000. There were 6,504 entries, those in the competitive classes being as follow:—

Horses	677	Harness	24
Cattle	782	Farm Produce	121
Sheep	509	District Exhibits	1
Swine	90	Dairy Produce	181
Poultry	538	Wines	244
Dogs	146	Fruits, Preserves, &c. ...	30
Carriages	260		

In a brief review such as this, it is impossible to deal with the whole of the exhibits, so it is only proposed to refer to the dairy breeds of cattle, and the pavilion of the Department of Agriculture.

Dairy Breeds of Cattle.

Since dairying is a very important feature of Victorian production it is gratifying to note the large number of entries of dairy breeds of cattle



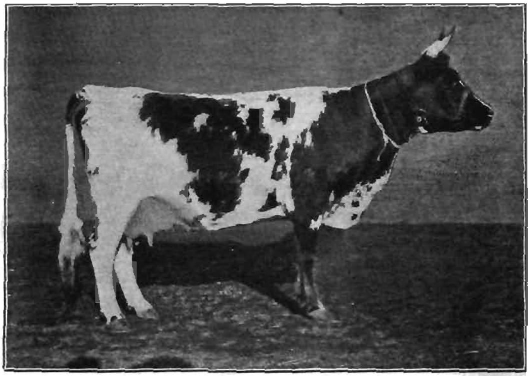
CHAMPION AYRSHIRE BULL, "LORD DOUGLAS."

at the recent Show, the figures being: — Ayrshires, 227; Jerseys, 124; Milking Shorthorns, 122; Holsteins, 7; Dairy Cattle (any breed) 30; total, 510. Those who had the privilege of witnessing the parades could not but be struck with the splendid stock shown. The illustrations of the respective champions in the Ayrshire, Jersey, and Milking Shorthorn sections will bear this out. Victoria has made great strides in butter production, the exports for last year being valued at £2,208,050, but still our dairy farmers can do much to increase this total if they will only see the necessity of working on right lines. Culling out the wasters and securing the services of sires of proved milking strains should be consistently carried out by all, and then, provided due attention is also paid

to conservation of food and water, Victoria will rise from her present proud position to a still more exalted pinnacle. The Show has proved conclusively that we have good stock in our midst, and that there is no need to breed from nondescripts.

The Ayrshire division is undoubtedly entitled to first reference. It embraced the largest number of entries, and, moreover, the champion Ayrshire cow, "Laura 4th," was also awarded the championship of all dairy breeds on the ground, another representative "Ada 2nd, of Glen Elgin," being the reserve champion. The Ayrshires continue to be deservedly popular. They are good milk producers, and, being naturally hardy, are general favourites.

The champion bull, "Lord Douglas," is by "Holehouse Brown Prince," out of "Lady Jean 2nd," and is 3½ years old. He is the property of Mr. G. L. Wilson, of Berwick, by whom he was imported. In Scotland he had an unbeaten record, and in March last he secured the coveted championship at the Sydney Royal Show. This magnificent



CHAMPION AYRSHIRE COW, "LAURA 4TH."

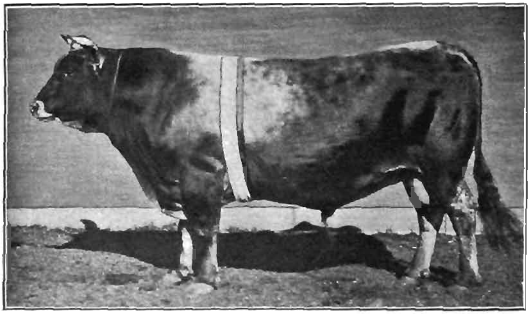
specimen shows more of the Australian type of Ayrshire than any other previous importation. He has a typical Ayrshire head, with fine horns, and is beautifully tempered. His chief characteristics are great length and depth of body, great width across the loins, and, particularly, length from hip bone to pin.

"Laura 4th.," is owned by Messrs. Cumming and Brisbane, of Weerite, and was sired by "Luminous of Oakbank," her dam being "Laura 3rd." She is under four years old, and shows strong Ayrshire characteristics, as well as dairy points. Like "Lord Douglas," she has a good head and fine horns. The length of the quarters shows plenty of weight behind, running off to the fore, being a good example of the wedge-shaped dairy

cow. She has a good escutcheon and breech. The milk vessels fill up the hind legs and extend well along the belly, the teats being of uniform length and set well apart.

The Jersey section contained some notable representatives, both locally bred and imported. Quite apart from its value as a butter producer, the natural grace and beauty of the Jersey ever command admiration. Although regarded by some as rather delicate for the rough and tumble of the average farm, there is no doubt that with reasonable treatment this breed is found exceedingly profitable.

Mr. George Woodmason's "Golden King" was the 1907 champion. He was calved in October, 1903, and comes from a good milking strain; his dam "Favie 1st." is now over twenty years old. "Golden King" is certainly a fine animal, and has worthily upheld the reputation of the Woodmason family as breeders of high-class Jerseys, beating at least two imported bulls in the contest for championship honors. He has a typical head and mouth—in striking contrast to the light under jaw of most of



CHAMPION JERSEY BULL, "GOLDEN KING."

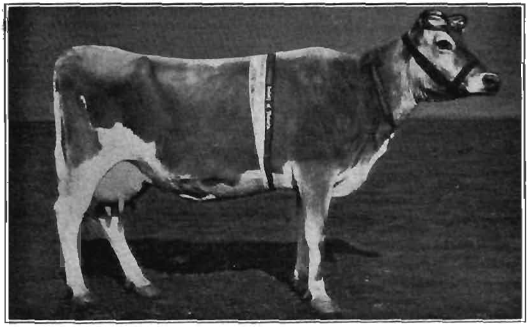
the imported Jerseys; an animal with a good mouth is more capable when put on the pastures of maintaining his condition, and is naturally stronger in constitution. The breadth across the muzzle is also marked, and the horns are splendid. He has a big deep body, is straight in the back, very broad across the loins and lengthy from hip to pin, is well sprung in the ribs, and has fine withers. The nipples are well set and of great length.

An imported cow "Fancy 14th.," belonging to Mr. G. T. Chirnside, of Werribee Park, annexed the red white and blue on the female side. She is fawn coloured with white markings, has a beautifully dished head with typical turned-in horns, open docile eyes, and broad expanding nostrils. The neck is very lean and thoroughbred, the shoulders razor-like, long and slanting, whilst she has a deep, well-sprung body and fine broad loins. She is very long from hip bone to pin, and altogether is a fine framed cow. The milk veins are very prominent, and the tail is well set. A week before the Show (30 days after calving) her test was

2lbs. 12ozs. butter for 24 hours—from 45 lbs. milk, 44 ozs. butter were obtained.

Milking Shorthorns claimed a good deal of attention, and to those breeders who like two strings to their bow, they have much to commend them, but at the same time their value to the dairy farmer is a moot point. The aim of the dairy farmer is, or should be, milk production, and consequently only reliable milk producers should be bred and kept by him. Whilst it is admitted that practically every herd of Milking Shorthorns contains some good milkers, as will be seen by reading the article by Mr. R. T. Archer on page 348 of the June *Journal*, the small farmer particularly cannot afford to take any risks; his business is milk production and not beef.

From a dairyman's point of view the exhibits were disappointing, showing, as they did, too much coarseness and beefy tendency. Chief honours went to Mr. Albert Miller's imported bull "Redvers," and to "Nancy 2nd," belonging to Mr. T. Lidgett, of Ballan. "Redvers," 2½ years,



CHAMPION JERSEY COW, "FANCY 14TH."

is a deep, rich coloured bull with a mellow coat. He lacks some of the chief characteristics of a dairy bull; for instance, his head is steer-like in appearance, whilst the neck and shoulder are coarse and the general conformity of the body too compact, the desired wedge-shaped appearance being absent.

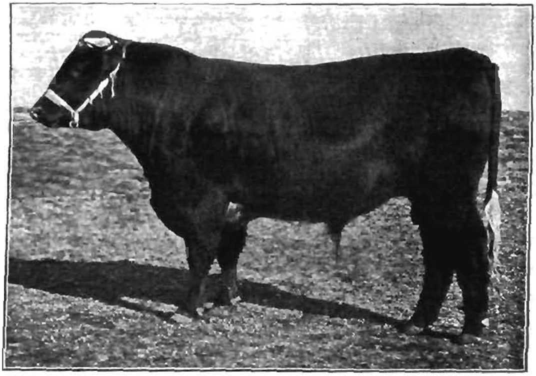
"Nancy 2nd," 8 years old, is a rich strawberry roan, and has a full open eye, and a mellow skin with soft hair. She has the characteristic Shorthorn head, and a beautiful deep body, but has the same drawbacks as the bull, being too beefy and coarse in the neck and shoulder.

The Holsteins were few in number, and, with one exception, were exhibited by Mr. David Mitchell, of "Cave Hill," Lilydale. Amongst the Dairy Cattle were some good specimens, but none of sufficient class to out-distance the thoroughbreds in the "best dairy cow" contest.

Departmental Exhibits.

As usual the pavilion of the Department of Agriculture was one of the leading features of the show, and the various exhibits were closely inspected by all the visitors. The management was in the hands of Messrs. Crowe and Knight, and the arrangement of the exhibits reflected great credit on those concerned. Many of the principal experts were in attendance, and dispensed valuable information to inquirers.

The Dairy and Export Branch was very much to the fore, attention being strikingly drawn to the production and export of butter, cheese, mutton, pork, preserved meats, poultry, and eggs. Mr. Crowe is always keen on putting facts into concrete form, and this year, in simple figures, the value of Victorian production in 1906 was prominently exhibited; Vic-



CHAMPION MILKING SHORTHORN BULL, "REDVERS."

toria's exports, and Great Britain's imports for the same period were also shown. The following are some of the principal figures:—

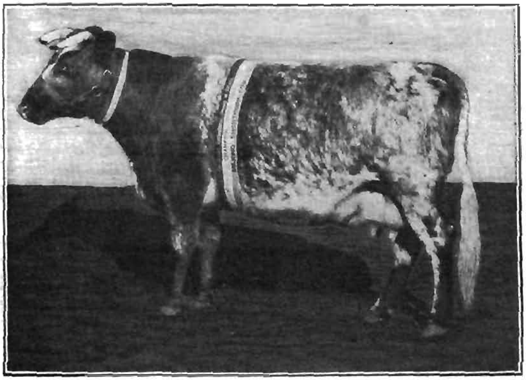
Product.	Victorian Production, 1906.	Victoria's Exports, 1906.	Great Britain's Imports, 1906.
	£	£	£
Butter	2,978,860	2,208,050	23,466,252
Cheese	116,860	26,896	7,607,641
Meat	2,480,226	550,627	30,163,113
Pig Products	325,381	83,397	24,253,330
Poultry and Eggs	1,500,550	16,716	8,083,594
Rabbits	...	249,398	1,000,786
Rabbit Skins	..	128,440 (30,000,000 skins)	589,696

The cheese exhibit was of special interest, seeing that the whole of the cheeses, both Cheddar and fancy, had been manufactured by the

students at the Leongatha cheese class, conducted by Mr. J. G. McMillan, cheese expert, during June, July, and August. The display was very effective, and Mr. McMillan had every reason to be proud of the results achieved. Connoisseurs were loud in their praise of the quality and finish of the various cheeses.

Prominence was given to the pork-raising industry. In addition to a good collection of bacon and other pig products, some fine carcasses of Yorkshire-Berkshire crossbreds, four and a half months old, averaging 140-150 lbs. each, were on view.

Mr. Hart had a series of good exhibits illustrative of poultry-raising and egg production, and ranging from a model poultry yard to the grading of eggs. Until recently it has been customary to grade eggs according



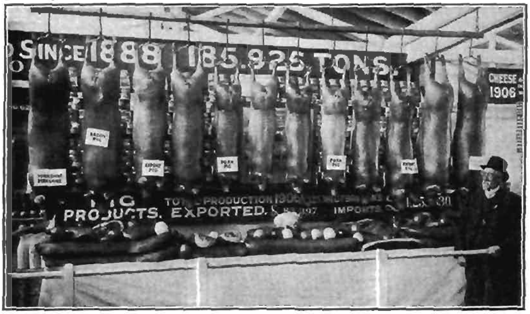
CHAMPION MILKING SHORTHORN COW, "NANCY 2ND."

to colour, but the latest advice from Great Britain, apparently in the interests of the small retailers, is to mix the eggs to a certain extent, so that the brown will help to sell the white. Daily demonstrations of poultry dressing were given by Mr. Hart and his staff.

The exhibits under the direct control of Mr. Knight were varied and interesting. Flax cultivation was well advertised, and the subsequent treatment—threshing, breaking, and scutching—was demonstrated by Mr. Robilliard. Exhibits of apples, kept in good condition by Little's Cool Air Process, and by the Meakin system of fruit storage, were closely inspected by orchardists. Fruit crystallizing and preserving were carried on by Miss Mendoza, whose labours were watched with appreciative interest by large numbers of visitors.

Mr. D. McAlpine (Vegetable Pathologist) had an effective display, consisting of specimens and photographs of the various fungus diseases affecting cereals, fruit trees, potatoes, lucerne, vegetables, flowers and

wattles; whilst the Government Entomologist (Mr. C. French) made a specialty of the various useful and destructive birds and insects that are



PORK FOR EXPORT—YORKSHIRE-BERKSHIRE CROSSBREDS.

the friends or enemies, as the case may be, of the fruit-grower. Mr. French has added a large number of life histories of insects to the

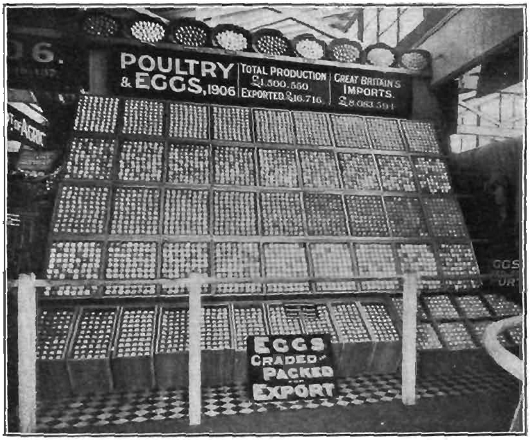
CHEESE EXHIBIT.

exhibit, and these, with his collection of Victorian gall insects, destructive to native timber trees, attracted much attention.

Professor Ewart (Government Botanist) and Mr. F. E. Lee (Agricultural Superintendent) had good exhibits. The former showed specimens of the various noxious weeds, and models of plants, whilst the exhibits of Mr. Lee consisted mainly of soil cores, mechanical analyses of soil, and a collection of wheat, oats and barley grown on the experimental plots during the past season by the field branch.

Messrs. G. Seymour and T. Smith (Potato and Tobacco Expert respectively) were present throughout the show, and gave much information to growers. The publication branch was in charge of Mr. Kemp.

Mr. H. V. Hawkins, Poultry Expert, exhibited specimens of the improved poultry crate described by him in the September *Journal*.



EGGS GRADED FOR EXPORT.

In the annex attached to the pavilion, the exhibits from Dookie and Longerenong Agricultural Colleges were located. The products shown were striking evidence of the practical work done at these institutions.

Outside, under the direction of Mr. Kenyon (Engineer for Agriculture) demonstrations of silo building and filling were given. A 60-ton silo, costing £30, was erected, and cutting and filling were done with the chaffcutter and elevator, and also by silage cutters and blowers as described in the August *Journal*. Sections of concrete silos were shown, and the making of blocks demonstrated. There was also a collection of buckscrapers and smoothers, and the sub-surface packer, recently imported from America, was on view. There is no doubt that the practical work done and the explanations given will mean a great increase in the number of silos throughout the State.

THE ELEMENTS OF ANIMAL PHYSIOLOGY.

W. A. Osborne, M.B., D.Sc., Professor of Physiology and Histology, Dean of the Faculty of Agriculture in the University of Melbourne.

(Continued from page 467.)

CHAPTER IX.

Animal Nutrition.

An animal that has reached adult life and is not increasing in weight must nevertheless eat, digest and absorb food which, as we have seen, serves as material for renewal and repair and for the supply of energy. In dealing with this subject it will be advisable to consider, the essential ingredients of food, the adventitious ingredients of food, the essential qualities of food, food required for growth, and finally the composition of various natural foods.

The Essential Ingredients of Food.

1. Repair Food.—Every living cell in the body is in a state of constant repair requiring a continual intake of fresh material. Moreover there are constant losses of complex material from the skin, such as the protein of sebum, hairs, and the outer layers of the skin itself. In lactating animals the secretion of milk is a heavy drain on many constituents of the body. Water is continually being excreted by the kidney, lung, and skin, and salts leave the body in the urine. All these materials must be present in the food consumed.

Water is present in all foods. Hay may contain as much as 13 per cent., oats about 18 per cent., green fodders vary between 60 and 80 per cent., and roots and tubers as much as 90 per cent. If the water taken in these foods is not sufficient then thirst is provoked and water is instinctively taken by the animal. The rule holds with the domestic animals as with man that the water supplied for drinking purposes should be pure and fresh and above suspicion.

Salts of soda, potash, lime, magnesia, phosphorus, and iron are all in the body, are constantly leaving the body and so must be supplied in the food. The various foods eaten by different animals are all fairly rich in salts, but with grazing animals there is sometimes a danger that too little common salt or sodium chloride may be present; for vegetable foods, though rich in potash salts, are poor in soda salts. This is particularly the case the more distant from the sea the grazing country is. Hence the instinctive relish with which most herbivorous animals lick common salt if placed within their reach. In lactating animals there is a considerable loss of lime in the milk, for this fluid contains actually more lime than does lime water. The amount of lime in oats and maize kernels is very small, roots also are somewhat poor in this constituent, but clovers are rich and to a lesser degree the grasses. Animals fed on salt free foods die speedily; even a poverty in one salt constituent will lower vitality and cause emaciation, skin trouble and feeble resistance to disease. Equally dangerous is a salt content much above what is in the animal's natural food.

Protein is a very important repair food for out of protein most of the solid matter of living cells is composed. A certain amount of protein must be taken in food to cover the constant loss through wear and tear of the body machinery. Protein in excess of this amount is used by the animal as fuel food and it is always advisable to have such an excess. Not all the protein eaten is digested and absorbed; this is especially the case when the protein is of vegetable origin, part passing through the digestive tract and leaving the body with the fæces. Carnivores and omnivores obtain rich supplies of highly digestible protein from the animal substances they eat, but vegetable feeders have more difficulty in obtaining their protein.

The following table gives the approximate percentages of proteins in various foods:—

Roots and tubers	1½—2
Most green fodders	2 —3
Cows' milk	3½
Clovers and alfalfa	4 —5
Hay from mixed grasses	7½
Hay from mixed grasses and clovers ...	10
Most grains	10½—12½
Wheat bran	16
Meat	18
Cotton seed (whole)	18½
Flax seed	22½
Beans and peas	21—34

As has been stated the proteins vary as regards their digestibility. The animal proteins are almost wholly digested but the vegetable proteins show marked differences in this respect. The percentage of protein digested is relatively high—70-88 per cent. in grains, seeds, clovers, legumes, and cereal by-products; medium, 50 to 70, in green fodders, hays and silage; and low, 20 to 45, in straws and potatoes. As a general rule the proteins are less digestible the coarser the fodder. A term frequently employed in animal dietetics is the *nutritive ratio* which means the ratio of the protein in the food to the remaining digestible organic matter expressed as carbohydrate.* Nutritive ratios are described as narrow, 1 to 5½ and under; medium; and wide, 1 to 8 and over. It has been found by experience that animals thrive better on a certain daily protein intake. Animals at rest or doing moderate work require 1½ to 2 lbs. protein per 1,000 lbs. live weight, with severe work, or with growing or fattening animals, or in the case of cows yielding over 16 lbs. of milk *per diem*, or ewes suckling lambs, 2½ to 3½ lbs. per 1,000 lbs. live weight are required. It must be clearly understood that only a fraction of what is absorbed from these amounts is required for body repair (in the case of a man less than one-third of the total daily consumption) the remainder being used for energy supply and for the laying on of fat or flesh.

2. FUEL FOODS.—All vital processes require an expenditure of energy which is derived solely from the food. Moreover the animal's temperature must be kept up, and this, too, must be met by the heat produced from the oxidation of food in the body. The more work an animal does, and the colder its surroundings, the more fuel food is required. The energy

* Fat can be expressed in terms of carbohydrate by multiplying its percentage by 2.4.

value of any food stuff can be calculated by determining the heat produced by burning a definite weight of the substance and measuring this heat. Such a determination is carried out in an instrument called a calorimeter. The unit of heat is the kilo-calorie which is approximately the quantity of heat which will raise one pound of water four degrees Fahrenheit.* The unit weight is the gramme which is roughly one-twenty-eighth of an ounce. In this way tables can be prepared giving the number of calories produced by burning one gramme of each food-stuff. Thus:—

Food. 1 grm., dry.	Kilo-calories.	Food. 1 grm., dry.	Kilo-calories.
Cane sugar ...	... 3.96	Wheat gluten ...	... 6
Starch ...	... 4.2	Mixed hay ...	... 4.5
Cellulose ...	... 4.2	Sugar beets ...	... 3.9
Egg albumen ...	... 5.7	Linseed meal...	.. 5
Caseinogen ...	... 5.9	Butter ...	.. 9.2
Gelatin ...	... 5.2	Fats and oils...	... 9.4

A correction has to be made in the case of proteins because these substances, unlike fats and carbohydrates, are not oxidised completely in the animal body, and are represented in the urine by urea and other bodies which have a calculable energy value. Making this correction and striking an average for the various proteins, carbohydrates, fats or oils, we may state that—

One gramme of protein will give rise to 4.4 kilo calories.

One gramme of carbohydrate will give rise to 4.15 kilo calories.

One gramme of fat or oil will give rise to 9.4 kilo calories.

A further correction must be made for the amount of each food stuff which escapes digestion. Thus, 1,000 grms. (2¼ lbs.) of starch which, if fully digested, would yield 4,183 kilo calories, really yield about 3,760, and the same weight of dry wheat straw instead of giving 4,470 kilo calories only gives about 3,330. It may be definitely stated, however, that the foods absorbed furnish the animal with the exact amount of energy which we can thus calculate and express in terms of heat units. *The foods which give energy are fats and oils, carbohydrates and proteins including gelatine.*† To these must be added small quantities of nitrogenous bodies, amides, and amino-acids, which are not proteins but which are closely allied to the products formed from proteins during digestion. It will be understood from what has been said that part of the protein is used for repair and part for fuel. Protein must always be present in the food but carbohydrate can replace oil or fat in a large measure.

If an animal eats more fuel food than it requires for heat and work, it either lays on fat or gets disturbances of digestion. If it eats less than is required it becomes emaciated.

3. Ballast.—*In every animal a portion of the food remains undigested*, and, by its presence, helps the bowel to force its contents towards the rectum. This undigested residue has been named ballast and is essential for the health of the animal. A rabbit fed on pure protein, carbohydrates, fat, salts, and water will die of inflammation of the bowel, but will live if indigestible material (say horn shavings) be added to its food. Carnivores require little ballast but that little is essential. In dogs

*More accurately defined, the kilo calorie is the amount of heat which can raise one kilogramme of water from 4 degrees to 5 degrees Centigrade.

†It should be noted that gelatine cannot act as a repair protein, as it does not contain tyrosin or tryptophane.

the phosphate of lime from bones acts as ballast; in cats the skin or hair or feathers of their victims. In both animals some earth is generally eaten with their food and this acts in the same way. In omnivores, such as man and the pig, ballast is present in the form of cellulose and woody fibre in the vegetables eaten. Grazing animals eat enormous masses of material which escape digestion and they have special digestive mechanisms to deal with this residue. The coarse fibres in fodders are only feebly digested and even the fine cellulose of vegetable cells only partially so. The silica of plants is also feebly absorbed. If a herbivorous animal be given a fodder poor in fibre or with fibres too finely chopped, digestion is impaired, the contents of the bowel tend to become stagnant and putrefaction by bacteria takes place giving rise to poisonous products which are absorbed. This is well exemplified in cows that "lose their cud" when placed on a fodder too rich and digestible.

4. ORGANIC ACIDS.—It is doubtful if carnivores require organic acids but omnivores and herbivores certainly do, and grave constitutional disturbances follow upon their disuse. Fortunately all the ordinary vegetable foods are rich in these acids or their salts. Fruits are exceptionally rich in organic acids and to this, as well as their ballast content, is due their beneficial action in man and other omnivores.

5. FLAVOURING SUBSTANCES.—If food is unpalatable, no matter how suitable it is in other respects, it is badly digested. The greater the relish with which an animal eats its food the greater is the amount of digestive juices secreted. The palatableness of foods is largely dependent upon the odours or flavours they possess and these are due to chemical bodies which, though they do not come into any of the categories mentioned, are nevertheless essential constituents of normal food.

7. ENZYMES.—Carnivores and omnivores do not require any enzymes in their food but with herbivores, and especially the ruminants, these are essential ingredients. As we shall see in the following chapter on digestion, one of the first transformations that food undergoes in the alimentary canal, is an autolysis, or self digestion, by means of enzymes existing in the living cells of plants. Hence it is that fodders which have been steamed or boiled may, under certain conditions, be not so well digested as the natural plant substances.

There are other essential constituents of diet but their exact composition has not been worked out, for mere traces of them are apparently sufficient. It is highly probable that the body is dependent for its supply of hormones on certain chemical substances which are present in food though only in small amounts. The effects of deprivation of these bodies are only seen in laboratory experiments.

ADVENTITIOUS CONSTITUENTS OF FOOD.

In the food of carnivores there is little that does not come under the headings already given. In the case of omnivores and herbivores variable quantities of substances are taken and absorbed which are either harmless and pass out of the body unchanged in the urine or have their harmful properties neutralized in the liver and leave the body as innocuous compounds. Herbivorous animals absorb from their food considerable quantities of substances allied to carbolic acid, and other substances allied to camphor, also sugars that have little or no fuel value. Useless mineral matter (nitrates, silicates and sulphates) may be absorbed in small quantities and excreted in the urine.

The Essential Qualities of Food.

Each food must be suited to the species of animal and even to the individual. It must have the proper digestibility and palatableness and have the amounts of ballast, etc., to which the species, through myriads of generations, has been accustomed. The essential constituents enumerated above must be present and in the proper ratios to suit the animal's needs. *In most, if not all, of the domestic animals, variety in the food* leads to better results than if one ration be too exclusively relied on.

If food be insufficient in quantity the animal has to draw on its own fat and flesh which are actually digested in the body by the ferments they contain, and sent into the blood-stream to make good the deficiency. An animal when completely starved loses nearly all its fat, a great portion of its muscle and spleen, a small portion of its heart substance, but hardly any of its nervous matter. During violent exertion an animal rarely eats enough fuel food; it draws on its supply of fat and glycogen (the latter present in the liver and muscles) and makes good the loss in these bodies during the rest which it ought to have after the exertion is over. Underfeeding with any of the above-named essentials will injure the animal, the most common instance being underfeeding with protein in the case of the ruminants.

Overfeeding when it exceeds what the animal can retain as fat and flesh, causes digestive disturbances. Excess of protein (an error which rarely occurs with ruminants) leads to putrefactive changes in the bowel by which poisonous products are produced and absorbed, causing muscular weakness and loss of fat.

Food Required for Growth.

A young animal requires protein, salts, and fuel food, in excess of its repair and energy needs. The milk of each animal suits the needs of the young of that species. Thus comparing cows' milk and human milk, we find in cows' a larger amount of lime salts to suit the quick bone-growth of the calf, whilst in human milk we find a larger amount of lipoid to suit the quick brain-growth of the human infant. Protein in excess of the repair amount is needed for the building of muscle and gland; fuel food for the formation of fat; lime and phosphorus for bone; lipoid for nerve, etc.

Proteins and carbohydrates can be transformed and laid on as fat in a fattening animal. In a pregnant animal the growth of the young *in utero* has to be considered. An animal with rapidly growing wool requires more protein. An animal recovering from fever or starvation requires fuel food and protein in excess.

Constituents of Some Foods.

To give here an extensive list of food-stuffs with their chemical content would be impossible. To obtain such information special treatises on the subject should be consulted. A few food-stuffs may however be given as types; the values, which are expressed in percentages, to be taken as approximate only.

It must be understood that a chemical analysis only gives the percentage amounts of each constituent in a particular food and gives little or no indication how much of each can be actually absorbed by the animal. This is particularly the case with proteins and fibrous residue; a fraction of the latter being digested and a fraction of the former

remaining undigested. The absorption of fat and digestible carbohydrate is on the contrary fairly good. It is however always necessary for each food material, not only to be chemically and calorimetrically analysed, but to be administered to the animal and estimations made of the composition and energy content of the fæces so that the amount absorbed and its energy value may be accurately calculated.

Food.	Protein.	Fat or Oil.	Digestible Carbo-hydrate.	Ash.	Water.	Indigestible matter.
Meat	18-19	10-16	..	1-1·8	64-67	..
Cows' milk	3.5	3.5	5	0.7	87	..
Separated milk ..	3.5	0.7	5	0.7	90	..
Eggs without shell ..	12	11	5	1	75.5	..
Potatoes	2.2	0.2	20	1	76	0.8
Cabbage	2.5	0.4	5	0.8	90	0.9
Pasture grass	3.5	0.8	9.7	2	80	4
Hay from mixed grasses ..	7.4	2.5	42	5.5	15.3	27
Oat straw	4	2.3	42.4	5.1	9.2	35
Turnips	1.1	0.2	6.2	0.8	90.5	1.2
Oats	11.8	5	59.7	3	11	9.5
Horse bean	26.6	0.1	50.1	3.8	11.3	7.2
Wheat bran	15.4	4	54	5.8	11.9	9
Cotton seed (whole) ..	18.4	20	24.7	3.5	10.3	23.2

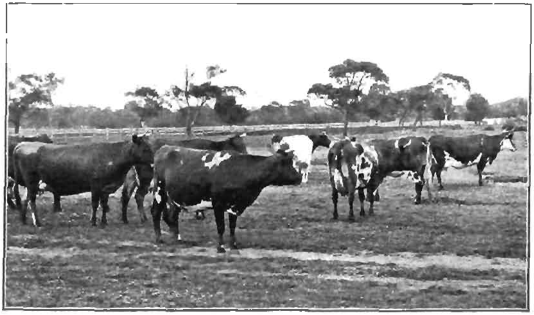
IMPROVING THE MILK YIELD.

J. M. B. Connor, Dairy Supervisor.

SILAGE AS A FACTOR OF SUCCESS.

The more I am brought into contact with the dairy farmers supplying milk to our large cities, the more I am convinced that silage is an immediate and necessary requirement that deserves more than passing notice. I do not suppose that any section of the community is so conservative in its methods as the dairy farmer. Certainly none is so difficult to move out of a groove, no matter what that groove leads to. It is this alone, to my mind, that prevents the sensible course of growing plenty of feed for their dairy herds from being carried out. I find when inspecting herds in different parts of the State that the question of the preparation of silage as a necessary stand-by is occupying much attention at the present time amongst the dairying community. With this in view, and the fact that a heavy growth of grass and other favorable conditions may be reasonably expected this season throughout Victoria, I wish to draw attention to the benefits which can be obtained by seizing the great opportunity which the fields and pastures afford; for it is surprising how many know little or nothing about the process or method of preserving and converting into silage the green succulent grass which is so plentiful everywhere during spring time.

If dairying is to hold its present position as being one of the chief industries of Victoria, there will have to be more attention given to this important matter of preparing fodder all the year round for the dairy herds. The trouble is always in the summer and winter months; the summer scorches up the pastures, and leaves the grass very scarce, so that when the autumn rains come, and the winter sets in early, it takes the dairy cows *all their time to live* without being expected to produce milk. This experience has been dearly learnt by the majority of dairymen and owners. It is then that they have begun to realize how the constitutions of the herds become undermined by poverty. If the owners of milking cows have not the welfare of their animals at heart, and do not devote time to discovering their needs, they will never realize that the cow is an animal with peculiarities and feelings that must eventually be consulted, if the owner ever expects to be possessed of a first-class dairy herd. Give your cows abundance to eat and drink all the year round, and the profits will be considerable, besides the pleasing sight of seeing the cows sleek



RESULT OF CAREFUL BREEDING AND FEEDING.

and healthy. If this is done we would not be so continuously hearing and reading of, and seeing the different so-called diseases in the various districts we visit, which in reality are brought about by no other cause, in many instances, than poverty and starvation. Somehow when things are at their best, as in the spring, and there is a flush of grass, dairymen seem to forget that we are likely to have more dry summers, and that droughts will come again. Therefore, the question at the present time for all dairymen to consider is—What are they going to do with the rush of grass and surplus fodder that they are likely to have? Leave it to be trampled down during summer, or let it go to waste, as they have been accustomed to do, and then repent of their folly during the cold winter months to follow. This mode of procedure would be nothing new, for the very same thing goes on around us every year. It is a mistaken policy to ever allow a heavy milking cow to become low in condition, either when at the pail or at pasture, for if she is not permanently injured as a milker

thereby, she will give a considerably less quantity of milk when she comes in next season as a contra account against the bad treatment she has received at the hands of her neglectful owner. Underfeeding has a serious tendency in producing stunted calves, and if we are to have good dairy cows, we must certainly breed them.

Silage versus Hay.

It must not be surmised that the main object of converting into silage the green succulent grass and fodder, which is so plentiful in all parts of the State during the spring of the year, is because there is any risk of its being spoilt by bad weather if made into hay. It is because by practical experience it has been shown that by ensiling a crop much more of the nutriment is preserved than if dried into hay, and that a given acreage will carry more stock; also by converting it into succulent silage the crop is available for purposes for which hay by itself would not be suitable, viz., for milk producing or fattening stock, without going to the expense and trouble of growing root crops to mix with the hay, to make the equivalent nutritive ratio.

The advantages to be gained by the use of silage have been proved wherever used, and it is within the means of every industrious dairy farmer to have a quantity of green fodder all the year round in the form of silage. The most suitable time to cut for silage is when the fodder has reached its highest state of maturity, and before there is any chance of its entering into the ripening stage. The overhead silo is now to be seen in most dairying centres of the State, but as this is beyond the means of large numbers of dairy farmers at the present time, it is necessary for them to know that holes any shape, simply dug in the ground where you can depend on the earth being sound, may be used with the greatest success. From my own knowledge, good silage can be produced by putting into the pit the green fodder, chaffed or loose, and simply covering it with 2 feet of earth; in six or nine months' time it will come out succulent and sweet. All kinds of weeds or thistles, if pitted whilst green and succulent, have been turned out six months afterwards in excellent condition, and during the cold winter months stock have devoured them ravenously. By saving the green fodder by this system, 30 to 40 tons can be silaged off one acre, thereby allowing a dairyman with a little land to keep a large number of stock, and at one-half the cost of other foods. I have known animals to fatten as well on silage as they would on the best of spring pastures. Another important factor is this, that the greater the number of animals you can keep on a small farm, the more manure you can save, and thus be in a position to put back into your land what the crop has taken out, and thereby keep up the fertility of the farm, and enhance its value at the same time.

In building a silo, whether overhead or under ground, the best form of a silo is one small in circumference and deep; the contents can then be removed from the whole of the top surface, and waste is thus avoided. Chaffing the fodder, if convenient, is the best method, as it presses tighter together, and thereby takes up less room than it would do if loose, and the mass subsides more evenly. If a crop is grass, loose filling will do; but if maize, or any prepared crop, it is advisable to cut into chaff for the reasons stated above. Barley, tares, and beans sown immediately after the first rains are very suitable crops for the first filling, as under ordinary circumstances they are ready to pit about October, when the same land

can be at once manured with the farm-yard manure, and reploughed and sown with maize or Japanese millet, which would be ready to pit about February, thus returning two crops off the same land.

IMPORTANCE OF GOOD COWS.

It has been proved without a doubt that it is a fallacy to expect a common-bred cow, even if she is continuously stuffed with plenty of nutritious food, to produce as much milk of a rich and profitable quality as a cow bred from a milking strain. Hence the necessity of breeding from a sire descended from a strain of both quality and quantity. A cow's biography is expressed, not in good deeds, but in quarts of milk. Dairying can only be expected to pay where conducted on right lines. Like other pursuits, there are many wrong ways, but only one right way. The foundation of the whole business is in possessing good cows. This can only be brought about by a systematic method of testing the whole herd of cows, and when the dairyman realizes this there will be some startling revelations, and ideal cows in the owners' estimation will go down hopelessly before the stern logic of practical test. Testing cows individually, and treating them on the merits of that test only, is the only sure and profitable way of increasing the output, and consequently the banking account of the dairyman. It is very often found that a cow which is an inferior producer is a large consumer of food. Say, for instance, the supposed best cows are large producers of a poor quality of milk, and even if this were not the absolute truth it often is, would it not be far more profitable to obtain the same quantity of butter or cheese from a less number of cows? So plain, simple and inexpensive a thing as testing the cows has no difficulties, except the obstinacy of the dairyman himself, and in the near future the regular system of testing every cow in the herd must inevitably be a part and parcel of the operations of the successful dairyman. What steps have been taken by the general run of dairymen in the past to secure this end? In the majority of cases that have come under my notice, none whatever. They seem to be content with any mongrel of a sire; their chief aim seems to be in getting their cows in calf, forgetting the plain and solid fact that for the dairy cows of the near future they will have to depend on the butter-producing qualities of the calves that are reared by themselves.

In the future breeding and feeding, coupled with shelter (which is sadly neglected on the majority of dairy farms inspected by me), will be the dairymen's stand-by, for without green succulent food the cows can give neither quantity nor quality of milk. My experience has been that the production of butter from a cow is in nine cases out of ten dependent on her breed, for there seems to be a structural limit to the richness of cow's milk, and if a cow is fed to this limit no feed seems to increase the butter yield. The character of the food no doubt has a good deal to do with the quality of the butter produced, but even here it would appear that the breed has a still greater influence on the quality of the butter; therefore, it becomes obvious that the future of our dairying methods depends a great deal upon breeding, feeding, and shelter, and if the dairymen would insist on buying only pure-bred sires descended from a milking strain, and securing heifer calves selected from good butter-tested cows, the milk of the latter, when they came in, would be rich in butter fat. In conclusion, I say it is not possible to make dairying pay without providing abundance of green succulent food for the dairy herd throughout the year, a wholesome water supply, and plenty of shelter.

PROGRESSIVE DAIRY FARMS.

J. S. McFadzean, Dairy Supervisor.

The accompanying illustrations are from the farm of Mr. F. Haworth of Mannerin, which is 16 miles from Geelong on the Queenscliff line. This property, when purchased about six years ago, was practically a

A DAIRY FARM HOME.

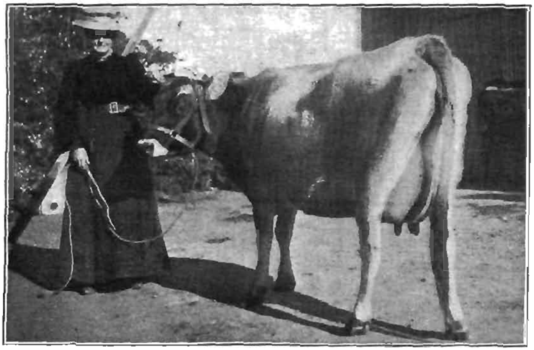
wilderness of cutting grass and ferns, and a breeding-ground for rabbits; and although the cleared portion of the farm is not yet being worked up to its fullest capacity, still sufficient progress in its cultivation has been made to demonstrate its possibilities. There are altogether 400 acres in

GOOD DAIRYING COUNTRY.

the farm which is subdivided into several paddocks of varying sizes. A small gully winds its way through the property, and carries to three dams sufficient water for the requirements of the stock. Four paddocks

of about 70 acres have been laid down in rye, cocksfoot, and cow-grass. Eighty acres are under cultivation; three of mangolds, twenty in barley, six recently sown with lucerne, and the balance sown for hay. This country grows wattle naturally; and the uncleared paddock which has been cleaned of much of the rubbish and undergrowth, and now used as grazing for the young cattle, also returns a fair amount in cash for the bark stripped from it.

What hay is needed for the stock is chaffed on the farm and the rest sold. The only expenditure for fodder for the stock is in the purchase of some two bags of bran weekly during the autumn months; and it is hoped that when established the lucerne will render the dairy farm independent of even this. Fifteen cows were milked through the past year and, from the particulars supplied by Mrs. Haworth, the gross returns from them averaged £11 14s. 3d. per head. The milk is separated and the butter made on the farm and sold in the Geelong auction market weekly.



QUANTITY AND QUALITY—A ROBUST JERSEY TYPE.

The skim milk is mainly fed to the calves and any surplus is used in mixing the food for the poultry. This latter branch of the farming is given more than average attention here with corresponding success.

The cattle show a lot of Jersey blood and the sire of the young stock is a Geelong prize-winner with a milking pedigree—being by Lohengrin from Waterlily—and was bred on the St. Albans Estate. His progeny are a well shaped lot of young stock with neat well balanced udders.

The management of the herd is in the hands of Mrs. and Miss Haworth who with the assistance of a lad do the whole of the dairy work; Mr. Haworth taking no part whatever in it, or the poultry yard.

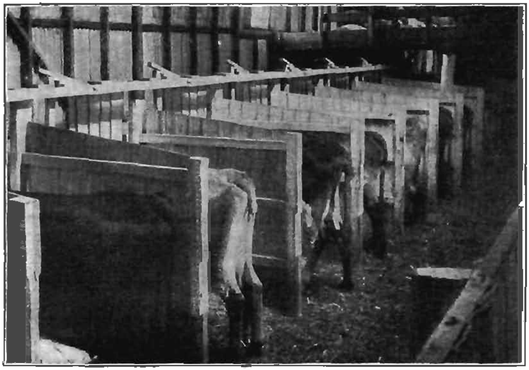
The water for the homestead is from the roof catchment and is conserved in a very large underground tank. It is raised by windmill to tanks as required, and piped over the buildings.

The dairy and milking shed are kept in excellent order; the stock are quiet and well cared for; and the dairying generally is an example

of what can be achieved by reasonable care without making the work laborious.

Another example of results obtained solely from proper care of milking stock is to be seen on the farm of Mr. C. Govett of St. Albans, near Geelong. There are 800 acres subdivided into some 20 paddocks; 40 acres are sown for hay which is not used for the dairy stock. Four acres of maize and 5 of lucerne were cut and fed to the cattle in the paddock. The grazing paddocks are laid down in English grass and well sheltered by hedges. No rugging, housing or manger feeding is done.

The returns for cream supplied to the Geelong Butter Factory for the year 1906 amounted to £1,345 12s. 3d. or an average of £12 9s. 2d. per head of the 108 cows. Besides rearing the heifer calves, a number of pigs are raised and fattened on the farm as an adjunct to the dairying. The noteworthy part of this return is that until some three years ago Mr. Govett was unable to obtain an efficient dairyman to take charge of this



HOUSING DAIRY CATTLE.

branch of the farm; and as the herd was not paying its working expenses, the owner was contemplating turning his attention solely to grazing, when he met his present manager, Mr Lucas, with the above result to date. Up to the present only rough culling has been practised. The cattle have all been tested as to the butter-fat contents of their milk, but no systematic recording of their individual yields has been carried out. However, the encouraging results of the past season have created a desire for improvement by every possible means, and increased returns without additional outlay are anticipated, so this testing of individual merit is to be made full use of.

The five bulls on the farm are Jerseys and are descendants of "Angler's Boy." Two of these stand out as typical sires of the breed, possessing both show and milking points. The cows are Jerseys, Shorthorns, Ayrshires and crosses, and the heifers and younger cows show the Jersey blood largely.

This property possesses great possibilities as a dairy farm; for almost the total area is capable of being irrigated from the Barwon River at small cost.

A PROFITABLE ADJUNCT.

CHEESE MAKING.*

J. G. McMillan, N.D.D., Cheese Expert.

Derby Cheese.

These cheeses are made to weigh about 30 lbs each and are flat shaped. The milk is thoroughly strained. The evening's milk is cooled down in summer to about 64 deg. Fah., and the cream is skimmed off in the morning and heated to 90 degrees, mixed with the new milk, and returned to vat. The mixed milks are heated to 84 degrees in winter and 82 degrees in summer. One-quarter per cent. of starter is added; the milk is then tested for acidity by means of the rennet test—25 seconds is generally a fair test but depends on locality etc., 3 ozs of rennet are added to each 100 gallons of milk and stirred in the milk for 6 or 7 minutes. The top should be stirred occasionally to keep down cream until the milk begins to curdle; 45 to 50 minutes are allowed for coagulation which should be firmer than for Cheddar. The curd is cut to about the size of broad beans by specially wide American knives.

The curd is stirred with the hands for half an-hour while the heat is raised to 90 degrees, then with the rake until it reaches 92 degrees in summer and 94 in winter. The heating process should take about 40 minutes; the curd must be just beginning to get a little firm when allowed to pitch. When the whey is fit to draw it should test about 16 per cent. acid and the curd draw fine threads about ⅛ inch in length. About 1 to 1¼ hours from cutting until whey is run off should elapse. When this is completed the curd is lifted on to a cooler and slightly stirred; excessive stirring will make it too dry. At this stage the curd should

* When Mr. McMillan visited Great Britain he was commissioned by the Department to inquire into the various systems of making cheese, and to furnish a report concerning the same, which was duly carried out. The accompanying description of the manufacture of the various cheeses is extracted from the report and published for the information of cheesemakers and others.—Editor.

resemble a huge jelly vibrating at the least motion. It is left for a quarter of an hour, then cut into blocks, turned and piled. This is done every 15 minutes, redoubling each turning. In an hour it should be ready for milling, when it should be tough, leafy, tear, and draw 1-inch threads. After milling, the salt, 1 oz. to every 4 lbs., is added almost immediately, the curd being well stirred in. The curd is then hooped and very light pressure applied at first until it reaches a ton. Acid of drippings from press should test .60 per cent.

These cheeses are ripe in about six weeks; some were made for experimental purposes into loaf Cheddar size and tasted very nice at the end of six weeks. Derby keeps good for three or four months if kept at a fairly low temperature. The hoops for these cheese are 6 inches deep and 16 inches in diameter. The texture should be fairly close; when too tight, too much acid has been developed. To make a long-keeping Derby, cut smaller, heat higher, and develop less acid on cooler.

Cheshire.

This is one of the most popular cheeses in England, being next to the Cheddar, which it resembles, but is softer and more open. There are three different kinds of Cheshire:—

(*a*) *Early ripening variety, ripe in 1 month's time.*
(*b*) Medium ripening variety, ripe in 2 to 3 months' time.
(*c*) Long ripening variety, ripe in 3 to 4 months' time.

The following table shows the temperature, amount of rennet, &c.—

—	Temperature at renneting.	Amount of rennet to 45 gallons milk.	Time to coagulate.	Temperature in scald.	*Amount of* salt to 20 lbs. curd.
	Degrees.	ozs.	Minutes.	Degrees.	ozs.
A	85	2	35–40	90	5
B	84	1½	40–60	92	6
C	84	1	40–60	94	7

The milk is ripened in the same way as for Cheddar, most acid being developed for the early ripening. Curd is cut larger in the early ripening, smaller in the medium, and finest in slow. In easy ripening, at drawing of whey, there should be ¼-inch threads, and less for the other varieties. Place on cooler and turn at intervals of 20 minutes until fit to mill, when it should be put through twice, one pound salt to 56 lbs. curd. After salting, the curd is hooped and placed in an open oven 75 to 80 degrees Fahr. and turned in the evening. It remains in the oven for 24 hours without any pressing, is then put in press, 1 ton up to 1½ tons being applied. The main differences in the three classes are quicker ripening, larger percentage of cheese, marketable earlier.

The disadvantages of quick ripening are that if not of best quality, the cheeses soon deteriorates if kept on hand.

This cheese might be made in Australia in winter but in summer there would be great danger of rapid fermentation owing to its soft nature.

Leicester.

To make two cheeses 92 gallons of milk are required, to which is added one quart of starter. This cheese is very highly coloured, 25

drachms of annatto being added to the quantity of milk stated. The settling temperature is 84 to 85 degrees, and 4 ozs. of rennet are added. The rennet test should be about 26 seconds, the acidity not being high. As the cream rises very quickly until coagulation begins, the surface is stirred occasionally. It should coagulate sufficiently in about 45 minutes; then cut three or four times with each American knife, the cutting being done very finely. Heating is then commenced and stirring done with the hands for 15 minutes or so. The rake is then used and the process of heating should last 55 minutes, or until the temperature is 93-96 degrees.

In half-an-hour the curd should draw a little more than ⅛-inch threads. The whey is drawn and the curd lifted on to a cooler, where it is stirred, all lumps being broken. The curd is not allowed to mat in the whey. After 20 minutes the curd is cut into blocks, then piled and turned, and piled every 20 minutes. There should be about 1 inch threads when ready to milk, an hour after being placed on cooler. The curd is milled twice and is quite granular when milling is finished, the object being to have an open cheese. After stirring for 5 to 10 minutes, salt is added at rate of 1 oz. to 3½ lbs. curd, which is then vatted and only slight pressure applied for the first three hours. Ripe in 10-12 weeks; hoops are 6¾ inches deep by 18 inches in diameter.

Port du Salut.

This is a cheese, as yet unknown* on the Australian market, that can be easily and profitably made. It is also one that will appeal to the public taste, not having the strong odour of the French soft cheeses, but being more of a texture resembling Cheddar. To make two cheese, 100 lbs. of perfectly sweet milk are required; temperature at setting to be 90 degrees, and 2¾ drachms of rennet should be added. Milk should take about 50 minutes to coagulate; the curd is cut once with the horizontal knives and twice with perpendicular, stirring is then done with hands while the temperature is rising to 104 degrees Fahr., which should take 45 minutes. It is then allowed to lie ten minutes. The curd should have a rubber-like feel at the drawing of the whey. When the drawing is done, the curd is placed in moulds lined with strainer cloth. When the curd is all in, place the cloth neatly over, put on a wooden follower, and place on a weight of 7 lbs. Allow to lie a quarter of an hour, then turn, replace weights, and turn again in another hour and again in another hour. It is turned about 5 or 6 hours after, and left until next morning. The hoop is then removed and a little salt rubbed all over, a very small amount at first, otherwise a skin is formed preventing subsequent saltings from penetrating. Leave until the next day and rub on more salt. The following day place in brine (1 lb. salt to every gallon water) for 15 minutes. The salting is sometimes done whilst in the curd state, one ounce salt to 5 lbs. being incorporated. After turning, the cheese is placed on straw in a fairly cool room at a temperature of about 60 degrees, and is ripe in about six weeks, but can be prevented by heating higher in scald. When ripe Port du Salut should have large holes, similar to those in Gruyere, and it should be soft in texture. The moulds are 10 inches in diameter by 4½ inches deep, with perforations in sides 2 inches apart.

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* Some made under the supervision of Mr. McMillan at Leongatha recently were on view at the Royal Show in September.—Editor.

Cleveland.

Perfectly sweet milk is set at 94 degrees Fahr.; one drachm rennet is added to 4 gallons milk and stirred in until rennet shows signs of acting. When firm, cut the curd with American knives to about the size of beans, clean the sides of vat and allow to settle for 10 to 15 minutes. Stir for 10 minutes, then raise temperature to 96 degrees and continue stirring from 20 to 30 minutes. Pitch for 10 minutes, then draw off whey and put curd in cloths in the cooler to drain, using pressure commencing with 14 lbs. up to 35. Open every hour or so and cut into 2-inch tubes and leave exposed to the air for 10 to 20 minutes. When curd is ready for hooping it should be firm, dry, and draw threads of 1 inch on the hot iron; the curd is then weighed and milled and to every 4 lbs. one oz. of salt is added. Line hoop with cloth and when full put to press with a pressure of 10 cwt., gradually increasing to 15 cwt. In quality these cheeses are similar to a small Cheddar; the hoops are 4 inches deep by 6½ inches in diameter.

Little Gloster.

Take, say, 40 lbs. fresh milk and heat to 86 or 90 degrees, add 4 drachms rennet and cut with a large knife. When coagulation is complete with particles about the size of dice, clean the sides of the vat with a perforated skimmer, occasionally using your hands until curd is small enough and the pieces all about the same size. Ladle out into dry strainer cloth and tie cloth loosely at first; leave to drain, tightening occasionally. Break up the curd in the strainer once or twice with the hands; when curd is dry enough to break up with fingers, place it in the moulds, pressing gently but firmly, the top to be left level and fine. Turn cheese when moulded half-an-hour, and again when bottom is firm. The first and third day salt all over, then take to cooling room. This cheese will ripen in about six weeks.

Caerphilly.

Take 85 lbs. milk; set at 85 degrees, and add half-a-pint starter. Rennet, 3 drachms to above quantity of milk, is then added. When the curd is firm it is cut once with horizontal, and twice with vertical knife. Stir up gently with hands for a few minutes, then allow to settle half-an-hour; stir again and heat up to 90 degrees, taking 30 minutes to do so. Allow to settle another half-an-hour when the whey is ready to draw. The curd is lifted into a cloth and tightened every half-hour, having been cut into slices frequently. When the curd is ready to set it should draw 1½-inch threads on iron; if the curd is dry do not cut up or turn so much. One oz. salt is added to every 4 lbs. curd, which is broken up by the fingers for salting. The curd is then put in a mould which has a false bottom. Pressure is applied gently at first, gradually increasing to 10 cwts. Caerphilly is a splendidly flavoured cheese, and one that should take on with Australians. The moulds are 10 inches wide by 4½ inches deep, with perforations about 2 inches apart.

Wensleydale.

This is a blue-veined cheese of splendid flavour. Take, say, 14 gallons of milk and bring same to a temperature of 84 to 88 degrees Fahr., according to weather. Add one drachm of rennet to every 4 gallons of milk.

The curd is ready to cut in 60 to 75 minutes, and is done with the American knives to about the size of beans. Stir carefully from bottom and sides of vat for about five minutes; then allow to settle for half-an-hour. Stir again for 20 minutes and raise temperature about 3 degrees over that which it was set at; allow to settle for 20 minutes, then run whey off and ladle curd into two cloths on a rack, tying up immediately it is all in. Cut and turn at intervals of about 20 minutes until curd is dry enough. When ready to salt it should draw about quarter-of-an-inch threads. The curd is broken up by the fingers, and to every 4 lbs., 1 oz. salt is added. The curd is then put in a hoop lined with cloth and kept as near a temperature of 65 degrees as possible; it is turned over in the evening, and next morning is put under 3 to 4 cwt. pressure for about four hours, then taken out and bandaged, placed on a wooden shelf and turned daily, taking about six months to ripen.

The whey at cutting should show .11 to .12 per cent. acidity, and .16 to .18 per cent. at hooping time. The moulds are 7½ inches diameter and 12 inches deep, and have false bottoms.

Gorgonzola.

Probably of all the blue-moulded cheese, the above-named is best known to the Australian public. It is, however, imported, and fabulous prices are charged for it. Now, there is hardly any cheese so easily made, and it is therefore quite unnecessary to import—every pound should be made within the State. The method of manufacture is as follows:—Take 55 lbs. of evening's milk straight from the cow, and when at 90 degrees add 7 drachms of rennet and stir in for two minutes. The curd should be firmly coagulated in 15 minutes, and is then ladled into two cloths and hung up to drain overnight in a room about 60 degrees. Next morning a similar quantity of warm milk is set with 8½ drachms rennet; when firm enough the curd is cut into squares about 2 to 2½ inches, placed on a rack lined with cloth for about an hour, being twice tightened up. The object is to obtain a dry, as well as a warm curd. The evening's curd is salted slightly, about 2 ozs. being added; a little old Gorgonzola is also put in to give flavour.

The hoop is placed on a board and lined with a cloth, a little of the warm curd is placed in first, then cold, and so on in alternate layers. The dry curd should always be put in the centre. The time of sinking is irregular; if curd sinks more in centre than at sides, the sides may be slightly pressed to make an even surface. It should be mentioned that the hoop is in two pieces—lower part 6⅝ inches, top part 5⅝ inches and 10 inches diameter. Invert as soon as curd has sunk to the level of lower tier. The cloth may be removed from the cheese as soon as the latter is fit to keep together. On day following vatting, the cheese is salted by rubbing a teaspoonful or more on the upper surface. In the afternoon the sides and other end are salted. Too much salt should not be applied or else a tough skin is formed preventing the escape of moisture and subsequent saltings from taking effect. Salt every day for six days, then place in brine for three days (10 per cent. brine) which should be 75 degrees Fahr. The curd should never be allowed to get chilled, otherwise draining is checked; the nearer the temperature is to 65 degrees, the better.

Allow cheese to stand until surface shows red orange colour, when it may be removed to a cooler room. The surface should be firm and tough, being at the same time greasy and smooth, without cracks. Red mould should gradually cover the cheese, developing best at a temperature of 50 to 55 degrees Fahr., in a cool, dark cellar.

Gorgonzola should be kept free from mites, which will not thrive when there is an excess of moisture.

Short details of the making of the cheeses mentioned have been given, for the following reasons:—

1. Because every one of them, particularly Derby, Leicester, Cheshire, Cleveland, Port du Salut, Caerphilly, and Little Gloster, can be made in the State of Victoria.

2. That all these varieties keep well, having no strong smells so apparent in French soft cheeses, and for this reason will suit the palate of the Australian.

3. Most important of all is the fact that Caerphilly, Cleveland, Port du Salut and Little Gloster can be made without much outlay by people having a small number of cows.

4. In each case a larger quantity of cheese is obtained than when Cheddar is made.

For makers on a big scale, it is advisable to stick to the Cheddar, as it is, without a doubt, the best keeping when well made, and its sale is almost unlimited; whereas with the other varieties the sale is limited, and it is better to leave such to smaller makers.

It is hardly necessary to mention that while in London I made inquiries as to whether there was a good prospect of an opening for Australian cheese. Reputable firms such as Clement and Son, and Lovett and Christmas, and many other cheese factors, who, while saying that Canadian and New Zealand were splendid cheese, see no reason why Australia should not have a good share of the market. The following is a letter from a London firm on the subject:—

The question of shipments of cheese from Victoria has been one which we have thought might be taken up, but the Victorian shipper has been so successful with his butter that we have hesitated to suggest any change, always bearing in mind that the shipments of cheese which have come from Victoria have not been altogether satisfactory.

To go over the ground in connection with the make, position, &c., of the cheese would really, we feel, be going over old ground, because no doubt you have got hold of all the works issued by the Canadian Government in connection with cheese-making, and these we should say are the most up-to-date of anything in print, as the various compressors in Canada and people there have made a study of cheese-making and brought it almost to a science. The great point to be borne in mind in connection with cheese for this country, is this, that we must have a mild cheese. Some people would almost call it an insipid, flavorless cheese, but anything which is strong or full flavored, buyers do not like, and if it is on the market, it has to be sold at a less price than it otherwise would.

As to opening up a trade in cheese on the London market there seems to us to be no difficulty whatever. You are not starting a dairying industry now, as all the difficulties in connection with it have been overcome through the opening up of the butter trade, and we have no hesitation in saying that any consignments which are sent to this market, whether they are received by ourselves or any of our competitors, would receive weighty care and attention.

It is hardly necessary to remark that the import of cheese in Great Britain is considerable. The following table will give the reader an idea:—

STATEMENT SHOWING THE QUANTITY AND VALUE OF CHEESE IMPORTED INTO THE UNITED KINGDOM DURING THE YEARS 1901–1905, DISTINGUISHING THE COUNTRIES WHENCE IMPORTED.

From.	Quantity.					Value.				
	1901.	1902.	1903.	1904.	1905.	1901.	1902.	1903.	1904.	1905.
	Cwts.	Cwts.	Cwts.	Cwts.	Cwts.	£	£	£	£	£
Netherlands	315,923	284,020	302,503	233,601	214,033	747,013	668,308	706,832	542,530	498,991
Belgium	74,071	70,372	87,998	63,694	64,389	223,917	228,184	284,341	201,487	223,568
France	26,833	36,801	36,004	44,268	48,884	83,880	113,611	113,531	138,289	158,224
Italy	714	732	728	642	727	1,832	1,939	2,096	1,744	2,164
United States	540,102	390,479	360,916	224,830	175,256	1,274,061	962,112	953,215	503,312	445,003
Other Foreign Countries ...	2,144	2,323	1,720	1,014	2,000	4,774	4,827	3,509	2,620	4,342
Total (Foreign Countries)...	959,787	784,727	789,867	568,049	505,289	2,335,477	1,978,981	2,063,524	1,389,982	1,332,295
New Zealand	79,094	51,875	56,339	84,947	78,626	193,149	131,036	168,071	217,286	203,344
Canada	1,547,739	1,709,565	1,848,142	1,900,556	1,858,767	3,697,660	4,301,859	4,823,090	4,234,790	4,804,172
Other British Possessions ...	217	45	10	745	...	849	126	25	1,712	...
Total (British Possessions)	1,627,050	1,761,485	1,904,491	1,986,248	1,937,393	3,891,658	4,433,021	4,991,186	4,453,788	5,007,516
Total	2,586,837	2,546,212	2,694,358	2,554,297	2,442,682	6,227,135	6,412,002	7,054,710	5,843,770	6,339,811

WHEAT JUDGING.

Mr. H. Pye, Principal of the Dookie Agricultural College, has furnished the following copy of the wheat-judging card used by students at the College :—

DOOKIE AGRICULTURAL COLLEGE, VICTORIA.

Student's Judging Card.

WHEAT.

Scale of Points.	Maximum Points.	Student's Award. 1	2	3	Corrected.
EDUCATIONAL. (Not to affect prize.—For educational purposes only.)					
Number of Exhibit					
Name of Variety					
Locality grown					
Rainfall					
Yield per acre					
Nature of Soil					
Treatment of Soil					
Rate of Seeding					
Fertilizers applied					
MARKET CONDITIONS.					
Purity of seed and trueness to type—Freedom from seeds of other varieties of wheat as may be detected by inspection or test	12				
Cleanliness—Freedom from bunt, smut, and moulds, also barley, oats, weed seeds, cavings, and dirt. Freedom from objectionable odours and weevils	12				
Uniformity—Evenness of size and plumpness. Absence of sprouted grains, also cracked grains. Soundness of germ ...	12				
Weight per Bushel—Grain to pour from hopper into a bushel measure until filled, allowing the same time and run for each sample; no jarring of bushel measure before the strike, otherwise grain settles down and a heavier weight per bushel is recorded	25				
Uniformity of Colour—Bright. Healthy. Somewhat translucent	9				
MILLING QUALITIES.					
Apparent to the Senses—Thin skin, grain neither too hard or too soft, more inclined to be hard. Freedom from too much moisture ...	10				
Determined by Analysis—Strong flour, gluten-content and quality good. Whiteness of bread	20				
Totals	100				

The points for purity of seed should be carefully considered when the grain is to be used for seed purposes, and a liberal deduction of points made if the sample be not true. In the absence of analysis the judge must rely on his experience.

Name of Student____________________

Date____________________

THE PROCLAIMED PLANTS OF VICTORIA.

(*Continued from page 498.*)

Alfred J. Ewart, D.Sc., Ph.D., F.L.S., Government Botanist; and J. R. Tovey, Herbarium Assistant.

The Cape Weed.

Cryptostemma calendulaceum, R. Brown. (*Compositæ.*)

A tufted plant, almost stemless. Leaves in a rosette, obovate, usually segmented, three to six inches long, cottony white beneath, glabrous above. Flowers solitary on slender stalks, one to one and a-half inches diameter. Ray-florets yellow, spreading; inner ones tubular, brownish. Achenes woolly.

An introduction from South Africa. A great pest in pastures as it spreads so easily from its numerous seeds, leaving the ground quite bare on the approach of summer. It can be hoed up before flowering, dried, raked together and burnt. It may be kept under by cultivation or by giving the taller grasses free play against it, and avoiding close cropping.

Proclaimed for the Shire of Poowong and Jeetho, June, 1901.

GARDEN NOTES.

J. Cronin, Inspector, Vegetation Diseases Acts.

The Sweet Pea.

Sweet, and everlasting peas, are annual and perennial species respectively of *Lathyrus*, a genus of leguminous plants embracing many species of decorative value as garden plants. Most of the annual species are natives of South Europe and North Africa, the species from which the present garden forms of sweet peas have been raised being *Lathyrus odoratus*, a native of Sicily. This pea has been in cultivation in gardens for over two hundred years, but its popularity as a valuable garden plant is of comparatively recent date. During the last twenty years a number of horticulturists in England and America have made a special study of sweet peas, and by cross-fertilization and selection have produced varieties of great excellence, the size and form of the blooms and the varied colouring and freedom of flowering in the new varieties arousing a deal of public interest in the plants. The culture of sweet peas has become a feature in most gardens, large and small, the hardiness of the plants, wealth of bloom under fair conditions, ease of culture, and the short period elapsing between the sowing of the seeds and the blooming season being the principal factors in their popularity. The flowers are produced in spring in Victoria, and embrace almost all shades of colour; the plants thrive under harsh conditions, but like most florists' flowers respond well to a little attention in the selection of site, soil and manure, and cultivation.

The everlasting peas—so styled on account of their perennial habit of growth—have been found native in various parts of Europe, Asia, and

PLATE 17

G. Wauer, Del. J. R. Tovey, Direx. J. Kemp, Acting Govt. Printer

CAPE WEED

(Cryptostemma calendulacium, Rob. Brown)

America. The kinds grown here and known as everlasting peas are *Lathyrus latifolius*—a native of Britain—and its varieties. As the plants are of herbaceous growth and rest in winter, the flowers of this species are produced in the summer months. Some improved forms of this pea have also been raised; the flowers are rose, white, and pink in colour and are much larger than the sweet peas. The plants are very hardy and are valuable for supplying cut blooms during the hot summer months. There are several species of *Lathyrus*, in addition to *latifolius*, that are worthy of a place in our gardens; one of the finest lately distributed in Australia is *Lathyrus pubescens*, a native of Chili and Ecuador. This is an evergreen perennial climber of very rapid growth, that produces masses of beautiful blooms of a lavender shade of blue, the flowers resembling a well grown lupin rather than a pea. Plants of this pea growing in Mr. J. V. Smith's garden, Bundoora, near Melbourne, have covered a large break-wind trellis during their second season of growth; one plant has completely overgrown a space of eight feet in height and fifteen feet in width and is flowering splendidly. Most of the flowers of this kind are produced in spring but there are occasional blooms at most seasons of the year. This pea is one of the best of recent plant introductions.

Cultivation.

The most suitable soil for the production of plants of the annual sweet pea that will bloom freely for a long period is a well enriched loam. The plants will grow under severe conditions, but as soon as the plant food and moisture are exhausted will cease to produce growth and to bloom freely. Soil for the reception of sweet peas should be prepared during summer, a liberal dressing of stable manure deeply worked into the soil being necessary. A light dressing of superphosphate of lime worked into the surface soil, or sown with the seeds, will assist materially in promoting a vigorous growth.

Sweet peas are true annuals, producing flower and seed and dying in one season, and are propagated exclusively from seeds. The seeds will produce plants bearing flowers identical with the parent variety unless artificially cross-fertilized, or by the agency of insects, the latter an unlikely contingency as the organs of reproduction are enclosed in the calyx or keel of the flower. Varieties that have been grown in Victoria for years have never varied from the original type although grown among other varieties. Seeds should be sown during autumn to produce strong plants before the winter season arrives, when they will resist any weather conditions that occur in the greater portion of the State. In very cold districts the sowing may be deferred until spring if it is found that the plants will not endure the winter weather. In the neighbourhood of Melbourne April is the best month to sow sweet peas. The most common cause of failure to produce satisfactory plants is the sowing of seeds too thickly. Sweet peas may be sown in clumps or in rows at a depth of one inch and six inches of space should be allowed between each plant.

The young plants need training on small sticks, when they attain a height of six inches, afterwards being trained on taller stakes, trellis, or wire supports. To increase the size and number of flowers the plants should receive a liberal supply of water during dry spring weather, and will benefit largely by an occasional watering with liquid manure. The flowers should be cut regularly or the season of blooming will be considerably reduced, the production of seed being the signal of cessation of

blooming. Plants will flower during the greater part of summer in moist and cool districts and situations.

In addition to the ordinary sweet peas that attain an average height of about six feet, there are two other types known as "Cupid" and "Bush" sweet peas. These are dwarf growing types; the first named grows to a height of only six inches, and the latter eighteen inches. They are useful for edges of borders, but on account of short flower stems are not as popular as the tall varieties.

The perennial kinds are propagated from seeds, divisions, or cuttings of the young shoots in spring under a bell glass. Seeds should be sown in pans or boxes early in summer, and may be transplanted in the following spring. *Lathyrus latifolius* and its varieties do not produce seeds freely, so propagation from divisions and cuttings is resorted to as a certain means of increase. Cuttings when rooted may be grown in pots for the first season, or may be planted at once where it is intended they should grow. They produce their growth during spring, bloom during summer, and die down to the ground during autumn. They are suitable for clumps in the garden, and for covering a trellis or breakwind. A deeply worked well-drained loam is suitable, and they may remain undisturbed for several years. *Lathyrus pubescens* is raised from cuttings or seeds. Plants from pots may be set out at any time during the season of active growth. They thrive best in a stiff loamy soil and require a position on an open trellis, where the shoots should be trained as growths develop.

"EARLIEST OF ALL"—SWEET PEA.

LATHYRUS PUBESCENS.—BLUE, PERENNIAL, CLIMBING PEA.

Selection of Varieties.

Many of the older varieties of sweet peas are unworthy of culture in comparison with new varieties of the same colour, and may be discarded with advantage, as the seeds of the better varieties are offered at cheap rates. A good collection should include Helen Lewis, Gladys Unwin, Mrs. Alfred Watkins. Nora Unwin, Frank Dolby, Queen Alexandra, Evelyn Byatt, Romolo, Piazzani, Black Michael, Helen Pierce, Henry Eckford, E. J. Castle, Countess Spencer, Mrs. Walter Wright, Miss Willmott, Black Knight, John Ingman, Dorothy Eckford, Hon. Mrs. E. Kenyon, Navy Blue. and Earliest of All, the latter being the earliest sweet pea. Perennial kinds:—*Lathyrus latifolius*, and the white variety *albus*, Pink Beauty, *splendens*, *grandiflora*, and *pubescens*.

Flower Garden.

Cultivation of the surface should be continued regularly, especially after a crust is formed after rain, or until the surface soil is brought to a condition of fine tilth. Fertilisers are practically useless unless the soil is in good physical condition, viz., well pulverized and mellow. A fairly drained soil of any description may be brought to a condition that will enable the cultivator to produce maximum results by a systematic and thorough working of the soil to a fair depth when being prepared for cropping, by the addition of material necessary for the class of soil as humus, sand, ashes, or clay, and afterwards by maintaining the surface in a loose and pulverized state. In dry districts, particularly, or where water is not available for gardening purposes, frequent cultivation of the surface is a necessity. A depth of two or three inches is sufficient, and will solve the problem of weeds while maintaining moisture.

Roses will produce their best spring blooms about the end of this month. If fine flowers suitable for exhibition are desired the flowering shoots should be reduced, the buds thinned, and the plants supplied with liquid manure occasionally. Any misplaced shoots should be removed as they occur, and where several shoots are developing in a bunch all but one or two that are well placed should be suppressed. Pruning of Banksian, and other rambling roses that flower early in spring, should be done after flowering. The old shoots that have bloomed should be cut entirely away, leaving only the young growths and training them as required. A close watch should be kept for caterpillars of geometrid moths, which destroy the flower buds and young growths. Mr. French recommends the use of white hellebore or nicotine, applied in the form of a spray.

Chrysanthemums intended for the production of exhibition blooms should be planted this month. Light soils should be firmly trodden before setting out the plants or the resultant growths and flowers will be coarse. A number of kinds of plants used for planting in beds such as alternanthera, iresine, salvia "Bonfire," &c., may be planted. They are effective in mixed borders and may be used to replace annuals and biennials that have flowered.

Seeds of tender annuals may be sown, or young plants raised under shelter transplanted. Seeds of Mina lobata, a beautiful climbing annual, if sown now, will produce plants that will cover a small trellis or break-wind and bloom freely during autumn. Divisions of dahlias and corms of gladioli may be planted.

Kitchen Garden.

Frequent cultivation between young growing crops, and weeding and thinning are necessary at this season. Good results cannot be expected if sunlight and air are prevented from reaching young plants by weeds growing adjacent. Without considering that such weeds rob the plants of nutriment, this factor alone is sufficiently important to justify frequent reference.

Seeds of melon, marrow, and cucumber may be sown in the open ground, and plants raised in frames planted out. The soil should be light, and well enriched; the addition of a little rapid-acting fertilizer insures the plants receiving an early start—a matter of importance. Plants should be well grown before dry and hot weather sets in, when they will produce and mature their fruits early in season. For small gardens, bush marrows are suitable, their growth being compact. They are abundant bearers and produce fruits until autumn, if well cultivated.

Seeds of carrot, parsnip, turnip, savoy, and red cabbage, for winter use; and beans, peas, and various saladings may be sown. The wax-pod or butter beans are stringless and of excellent flavour. It is predicted that when they become better known they will replace the ordinary French beans.

Plants raised from seeds earlier in the season should be transplanted when ready.

IMPROVEMENT OF SOILS.*

H. Jacob, Mildura.

Having previously had good crops of maize by the application of farm yard manure, I thought it might interest you to know that I have this season had one, if not the best, without any manure at all. The article in the March *Journal* on the Outlook for Agriculture, explains the whole matter. This crop grew on an average, 9 or 10 feet in height. It was the healthiest and darkest green possible, and not the slightest sign of yellow leaf underneath. The following are the facts concerning this crop. In altering my land I had occasion to plough up an acre of land which had been under lucerne for 15 years. Before that I grew barley on it, but the ground refused to grow any more, and the last crop was hardly worth cutting. I put it under lucerne, which grew splendidly. Until 5 years ago no manure was applied but since then 2 cwt. of superphosphate per acre have been put on each year. During the 15 years, of all the lucerne grown, none was put back in the shape of farm manure. The quantity taken off was 5 cuttings a year (1½ tons each cutting), making a total of 7½ tons hay, which in 15 years amounted to 112 tons.

This ground, which was too poor to grow a payable crop when started, is now, after yielding 112 tons of dry hay, left richer and in fit condition to grow the healthiest crops possible. When cultivating, I examined some

* NOTE.—This paper has been extracted from a letter written to the Department by Mr. Jacob. It is too valuable to allow to remain unused, although there are some points in it which require further investigation before they can be fully accepted.—EDITOR.

of the lucerne roots which were pulled up by the cultivator, and found them full of air bubbles or in a state of fermentation. It is quite possible (speaking of the land at Mildura) to take up poor land and bring it into profitable condition at once, as all leguminous crops flourish here. The tares sown with the barley did splendidly. The ground was slightly poor, but the tares filled up the spaces and I had a very heavy crop of splendid feed. I have recently bought 30 acres of poor land, land which has been cropped until it would bear no more. Of this I have planted 10 acres with lucerne. This season I have cut it twice and grazed once and it has started well all over. The other 20 acres I am going to divide up into four equal lots, with a water hole in centre, so that the one water hole will serve each lot. Three lots will be under crop, the fourth the cattle will be on. This plan of subdivision works very well, as there is no waste or manure to pick up and the liquid manure is all saved, while when yarding and feeding it is lost. They will go round the lots in rotation. As soon as all feed is cut and taken off, they will enter the paddock, and the previous one will be ploughed and sown. As this ground is poor, I am putting in tares with the barley, and thereby I hope to have a good crop of feed. In a few years without any outside help in the shape of manure, I hope to bring this land up to a high state of cultivation. On my land at home, I cannot arrange things so well, as, being laid out under fruit and vines I have the buildings all on one side, and I find it inconvenient on account of water to put the cows on small lots, so I have to yard, and clean up manure.

Another thing which has done well with me has been my lemon trees. Last year I had £120 net, for a little over an acre. Lemon crops last year were very small, but mine was the heaviest I ever had. The present crop exceeds last year's. In fact I think they have overdone themselves, as several trees have collapsed under the weight of fruit. Two trees have split the main stem and big branches have broken off others, and there are more to come, as the lemons are only about three-quarters grown. This week I have been picking what ripe ones there are. About three tons have been picked but do not appear to have made the slightest difference. I am now able to give a good estimate of the crop, which, I think, will run up to 20 tons, as against 10 tons for last year. Lemon trees all over Mildura are dying, and are being pulled up, although all kinds of manure have been applied. These trees are a healthy dark green, whilst five years ago they were a sickly yellow. Eleven years ago I put artificial manure on, but it was no good, so I dug up about 3 acres in 1900 and left the rest in for shade for calves and pigs. Some think the calves and pigs have done it. All the calves and pigs have added is the manure from skim milk and a little pollard. I put it down to a clover which grows wild. I first sowed rape 4 years ago, but none since, as this clover came in itself, spread all over, and grew as well as if it had been sown. At the present time I have a beautiful crop, every inch of the ground being covered. It grows up to 1 foot high. After the lemons are picked I put in a lot of young pigs and half-a-dozen calves to eat it down. In November I ploughed it three different ways, 3 inches deep, then disc harrowed it three times. I water it in March and then leave it alone and up comes the clover again. So I have brought back this land into good heart without any outside help. I now think that we, as farmers, are only just beginning to learn and feel how little we know when we thought we knew everything.

PROBLEMS AFFECTING FRUIT TRANSPORTATION AND MARKETING.

Ernest Meeking, Inspector under Commerce Act.

The mail reports on shipments of fruit from Australia to the United Kingdom and Europe sometimes contain such information as:—"The fruit shipped per S.S. ....arrived on the market in an unsaleable condition owing to waste caused by decay, bitter pit, &c. Such of the shipment as was sound realized good prices." Similar reports are received each season, especially in connexion with the earlier shipments, and they are now looked upon by some as inevitable and are read by them with little more than passing interest; but in the case of those who are in the unfortunate position of having a financial interest at stake, or who are jealous of the reputation of our country's products, feelings of chagrin and wonder are engendered—chagrin at loss of money, labour and reputation, and wonder at the apparent indifference which permits the causes adversely affecting the quality and prices of our products to work unchecked without steps being taken to prevent their recurrence. That it is possible to prevent this has been amply demonstrated in recent years in the United States, the country which stands pre-eminent as the largest fruit producing and exporting country in the world.

The problem of successfully transporting fruits over long distances is far from simple and is hedged with many difficulties, owing to the delicate nature of the product, and because the work of transportation from the orchard to the consumer includes many factors such as picking, packing, fluctuations of temperature, &c., which promote decay and adversely affect the quality of the fruit. In addition to these there are other causes deeper and less apparent but none the less powerful which must be taken into consideration. These are the chemical and physiological changes taking place in the fruit both whilst growing and after severance from the tree. These changes are influenced by the heredity of the fruit as well as by its environment. All these factors and many others, are now, and have been for the past few years, receiving careful study, aided by elaborate experimentation, both in the United States and Canada.

Some six years ago owing to a glut in the local market, the result of a combination of circumstances, the fruit growing industry in the United States received a severe check. The people interested, aided by the Government, set to work to devise means whereby a recurrence of such a calamity could be averted, and it was decided to send a series of experimental shipments to the European markets. These were picked, packed, graded, and shipped under Government supervision. Every influence affecting the condition of fruits, both whilst growing and during transit, was studied. Agents were sent abroad to find suitable markets for different kinds and varieties of fruits, and in fact the whole question in all its aspects, both scientific and commercial, was closely studied and so far the following facts have been determined:—

Harvesting and Packing.

A great deal of the deterioration and waste occurring amongst fruits consigned to distant destinations whose transportation must of necessity

extend over a lengthened period is due to rough usage during harvesting and packing, causing breakages in the skin. The result of the evidence adduced regarding the percentage of fruits destroyed by this cause was rather startling, as it was proved beyond doubt after exhaustive trials that from 30 to 60 per cent. of all waste occurring arose from this. Harvesting and packing are now in consequence becoming specialities quite disassociated from the growing and cultivating of fruit. Companies of commercial men in some instances, and in others associations of fruit growers themselves have been formed. These now buy the fruits at the orchard, handle, pack, transport; and in short wholly deal with the fruits until placing them on the markets. This entails the employment of expert harvesters and packers. These are sent from orchard to orchard, and means are devised in most instances whereby each man's work of harvesting and packing can be checked. It has been found that the use of complicated machinery for grading and packing fruits is not advisable as there is greater liability to skin injuries when fruits are dealt with in this manner than when they are graded and packed by hand. As a result of this knowledge many of the packing houses in California and elsewhere have discarded the machinery which was used for this purpose and are resorting to the manual method. The companies and associations which deal with the harvesting and transportation of the fruit also include in their programme cold storage.

Cold Storage.

In connexion with this side of the question it has been ascertained that an *even* temperature of 32 or 33 degrees Fahr. is the best at which to keep most fruits. At these temperatures moulds and decay of all kinds are arrested, the ripening processes are retarded and the fruit remains in good preservation longer after removal than when stored at higher temperatures. Every degree of temperature above 33 causes a proportionate advance in the rapidity of the ripening processes, and also in the development of moulds and kindred forms of decay.

A rapid increase in the quantity of fruits placed in cold storage in the United States quickly followed as the result of this knowledge. In 1898-9 there were 800,000 barrels in cold storage; in 1903-4 there were 2,348,540 barrels. The charges for storage average from 40 to 60 cents per barrel and from 15 to 20 cents per box equivalent to 1s. 8d. to 2s. 6d. per barrel and 8½d. to 10d. per bushel box for the whole storage season from 1st October until 1st May following. These charges appear exceedingly low, but the storage accommodation is so large and the quantity available for this purpose so great, that good profits are realized notwithstanding.

Full grown, well matured apples (provided they are hard and firm when picked) keep longer in storage than apples prematurely harvested. Perhaps this is because the growing cells in the immature apples adapt themselves to their environment, and after they have become accustomed to the changed conditions, continue the ripening process and proceed to full development unchecked. This would not occur in apples which had passed their life history under normal conditions until fully developed. Pears should not be allowed to ripen quite so fully as apples, but should be picked at early maturity.

The higher the temperature at which fruits are picked, the more speedily should they be placed in cool storage after picking, and the

lower the temperature at which they should be stored. For instance fruits picked at 80 degrees or 90 degrees, or higher temperatures, should be cooled as quickly as possible, after picking, to the necessary 32 or 33 degrees. The time required to chill fruits is influenced by the temperature of the fruits when stored, by the quantity of packages placed in storage, by the size of the packages and density of the outer coverings, and by the amount of air accessible to the fruit. From 40 to 60 hours are required to chill an ordinary single one-bushel case of wrapped apples right through to a temperature of 32 degrees when the fruit has been picked at temperatures of 80 or 90 degrees. It is preferable, therefore, to pick fruit in the early morning than in the heat of the day. Apples packed in barrels require a longer time to chill than those packed in cases. This fact has caused the use of cases in the United States to become more general. Pears, of course, should be made up in smaller packages than apples. Cases should be well ventilated in order to allow free access of the cool air of the storage chamber to the fruit. Fruit should be stored apart from any other product.

Wrapping the fruit retards it from chilling rapidly, but it possesses so many compensating advantages in the matters of preventing bruising and checking the spread of decay from one fruit to another, that this disadvantage is more than counterbalanced. In fact, American experts advocate the use of double wrappers, the inner one of ordinary wrapping paper and the outer one of paraffin paper.

These methods of maintaining temperatures during storage and transit and many others affecting the harvesting, transporting and marketing of fruits are still being closely studied in the United States. Some of the companies and associations dealing with the matter from the commercial side are huge concerns with large assets. Cold storage accommodation has been erected all over the country, both in orchards and at railway sidings, as well as in the large commercial centres. The various railway companies have fallen into line and have made exhaustive trials with various kinds of refrigerating cars. The more successful of these are fitted with appliances whereby cold air may be forced through the car from the cool stores at the railway sidings by means of connecting tubes. This insures the top tiers of fruit in the cars being cooled as rapidly and effectively as the lowest tiers. A mixture of salt and ice is used to maintain the lowest temperatures possible during the time occupied in transit by rail.

Trouble and Expense Justified by Results.

All the trouble care and attention given to these and other items has of necessity entailed the outlay of much money. The question naturally arises, has this expenditure been justified? In 1899-1900 only 1 per cent. of the total crop raised in the United States was exported. In 1903-4 this had risen to 4.75 per cent. The figures for 1905-6 are not yet available but a further increase was anticipated. This has resulted in easing the pressure in the local markets and has given the producer a chance to dispose of his surplus stock. Better prices have resulted and a large influx of foreign capital has been caused. It has also given a great impetus to the export of other fruits than apples, notably in fruits of the citrus family. In 1876 California sent away its first car-load of 300 boxes of citrus fruits. In 1905 10,000,000 boxes valued at 27,000,000 dollars (£5,625,000) were sent all over the United States,

Canada, and Europe. Peaches and other soft fruits are now successfully exported from Georgia, West Virginia and Connecticut to Europe.

EXPORT TRADE.

New markets have been formed in Europe by the agents of the abovementioned companies and associations, and in all instances a large and profitable trade has been established. These agents have made it their business to discover what kinds and varieties of fruits are favoured in different countries. By this means a promiscuous dumping of fruits on unsuitable markets has to a large extent been avoided, and a wider distribution has been secured. For instance, it was found that in Paris highly coloured varieties of apples did not meet with a ready sale, but that a good market was available for yellow and russet varieties. Another advantage gained by this distribution of markets is that each locality of the exporting country can make a speciality of growing the varieties suitable for each market. If Cleopatras for example sell well in a certain market the locality where that variety can be most successfully grown should cater for that market. In a country like ours where so many varieties of apples can be raised this should easily be accomplished, and we would not then witness a repetition of the deplorable slump which occurred through 170,000 cases of our fruit being dumped on one market as happened during one memorable fortnight of our export season just concluded.

The requirements of a successful export trade in fruit seem therefore to be:—

1. Careful harvesting and packing; the speedy cold storage of fruits in low temperatures after picking, and the maintenance of these low temperatures during transportation, as well as during the time the fruits are in storage.

2. A study of the physiological and chemical changes which take place in fruits in all stages of their existence, in order to explain why differences exist in the keeping qualities of individual fruits even when subjected to similar treatment with regard to cultivation, harvesting, packing, storage and transportation.

3. The regulation of the disposal of our fruits in markets where they find a ready sale.

4. The reduction of transport freights by land and sea.

5. Prices in local markets to be regulated, and gluts avoided by storage of excess fruits, thus obviating necessity of placing these hurriedly on the markets.

6. The formation of companies or co-operative associations with sufficient capital to deal with these problems, and to place the trade beyond the reach of untoward circumstances.

When the difficulties under which our trade at present labours through want of attention to these details have been successfully grappled the fruit-growing industry should become one of the State's main assets and the exporter should then be enabled to obtain a good profit if receiving anything above 6s. per bushel for his apples or pears in the markets of the United Kingdom and Europe.

THE ORCHARD.

James Lang, Harcourt.

The weather has been unusually dry for this time of the year, and so as to push on with the ploughing of the orchard advantage will need to be taken of any rain that may fall; once it is well ploughed it is an easy matter to keep a good tilth with the scarifier throughout the summer. Those who have no means of irrigating their orchards during the summer should keep the surface of the ground loose and friable, and so conserve all the moisture possible. By doing this, trees will have a much better chance of maturing their crops than if the ground is allowed to become hard and weedy. From present appearances we are likely to have a very dry summer, with very drying winds. The latter soon dry up the moisture unless a loose surface is kept up throughout the summer.

Woolly aphis will now be showing in spots here and there on the trees that were missed at the winter dressing. The trees should again be gone over with the potash and sulphur remedy and all spots showing should be touched with the brush; this may seem a slow process but it is effective, and it is astonishing how quickly by continuous effort one can get over the trees. If this is done now, and again in a few weeks, the aphis will give very little trouble for some time. Trees that have been sprayed with red oil should also be gone over with the potash mixture, and any aphis showing brushed off.

Spraying for codlin moth should be attended to during the month; the first spraying should be given just when the petals fall from the calyx, and before this closes up. Repeat at intervals of not more than a fortnight; the first few sprayings are the most important and should not by any means be neglected. One grub of the first brood destroyed is the means of preventing many hundreds later on; orchardists should therefore see the necessity of making the first sprayings thoroughly effective. The arsenite of lead has been the most successful spray used in the Bendigo and Harcourt districts during the past two seasons, and it is not so liable to burn the foliage as many of the other arsenical sprays. It is made as follows:—take 1 lb. white arsenic, 2 lbs. of washing soda, and one gallon of water; boil for half an hour, then take 7 lbs. of acetate of lead and dissolve in 2 gallons warm water. When using take 1 quart of the arsenic solution, and 2 quarts of the lead solution, pour these into a bucket, and a thick creamlike liquid will be the result; this should be put in the spray cask with 80 gallons of water and will then be ready for use.

Spraying apple and pear trees with Bordeaux mixture for black spot should be carried out. It should be done just before the bloom opens. The standard formula for making Bordeaux is 6.4.40 (bluestone, 6 lbs.; lime, 4 lbs.; water, 40 gallons), but in the drier districts 50 gallons should be used.

Peach trees will need looking after for the curl in the leaf and black aphis; spray with Bordeaux mixture for the former and tobacco wash or kerosene emulsion for the aphis.

Young grafts should be carefully inspected, the ties loosened, and the scions properly secured to stakes to prevent them being blown off with the wind.

Strawberry plantations should be well hoed and scarified to destroy weeds; a mulching of clean straw will keep the fruit clean and free from sand and grit.

SILO BUILDING.

A. S. Kenyon, C.E., Engineer for Agriculture.

Since the publication of the specifications for the construction of a 60-ton silo in the *Journal* for February, 1906, some slight alterations and modifications have been adopted. It is well, therefore, to publish the specifications and quantities now being worked to. These are, of course, not final. Many suggestions from esteemed correspondents have been adopted and more will be welcomed. The use of a preservative coating of tar or similar compounds on the inner face of the iron lining has been abandoned as the action of lime is antagonistic to such substances. As the lime wash is essential, even more care has consequently to be employed in seeing that it is well and thickly put on. It is advisable even to limewash as the silo is emptied to preserve the iron before refilling

100-TON SILO AT MILL PARK, NEAR MORANG.
30 feet high, 14 feet 8 inches diameter. Erected on the latest approved methods.

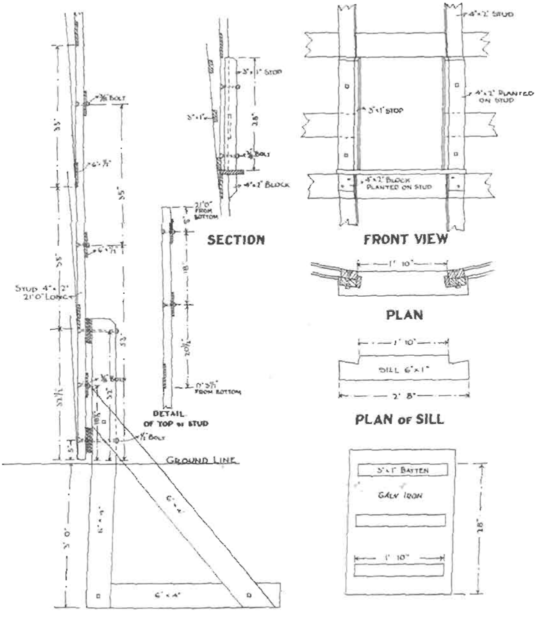
takes place. Successful silage making depends upon the faithful observance of the details of the directions for filling and successful construction is also a question of careful work. None of the points laid stress upon are unimportant. They are all the fruits of experience and have been carefully thought out and tested before being recommended.

Specifications for the Construction of a Silo 14 feet 8 inches inside diameter and 21 feet high.

All the materials used are to be of approved quality and the best of their kind. The timber is to be specially free from knots and gum veins. The foundation posts and the iron sheets (one side only) are to be tarred before commencing erection.

The Foundation.—Roughly level site for a diameter of 16 feet, making provision if on slope for drains to carry off any flow of water. Prepare eight foundation posts (6 by 4 redgum) according to drawing

herewith. Bolt the sole and post together edgeways and halve the strut in both sole and post. Secure with ½ inch bolts. Fix a peg in the centre of site selected for silo and with a trammel 7 feet 8 inches in length describe a circle. Sink posts 3 feet in ground so that the inside face of



DETAIL of FRAMING DETAIL of DOOR

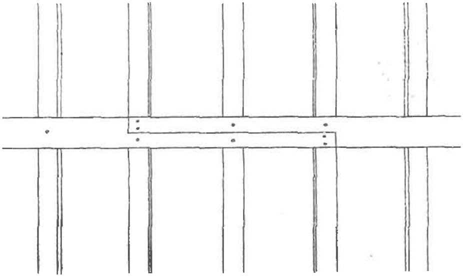
FRAMING AND PORT HOLES.

each post is true to the end of the trammel. Keep tops of posts to one level and faces truly perpendicular. Well ram the earth put back. From the centre line of face of post to the same line in the next post is 5 feet 10½ inches measured straight. Put the posts in to suit line of roof ridge which should suit position of chaff or silage cutter and elevator. The elevator should go in at top of silo in line with the ridge.

The Treble Hoops.—Nail three of the 6 by ½ boards to the inside of the posts, carefully springing the first of them to the circle of the trammel (cut half an inch, the thickness of the board, off trammel). Make

butt joints and let each successive hoop break joints. Keep the first treble hoop 3 inches clear of the ground. A similar treble hoop is fixed so that its upper edge is 36 inches from the ground. These two treble hoops are used to fix studs in upright position.

THE STUDS AND SINGLE HOOPS.—First bore and check studs as shown in drawing. The thirty-two studs (6/24 and 26/21—4 by 2) are to be bored for bolts, and countersunk ½ inch deep, ¾ inch clear, for heads of bolts. The first hole is to be 5 inches from the bottom, the second 18½ inches, the third 32 inches, the fourth 53 inches and thence at intervals of 35 inches the ninth being at 19 feet; the tenth and last is 20 feet 6 inches from the bottom and 6 inches from the top of the 21 feet studs. The first and third holes are to be bored for ½ inch bolts and all others for ⅜ inch. All studs are to be checked out 6 inches wide and ½ inch deep on the same side as the countersinking; from bottom of stud to bottom of first check 32½ inches; and from bottom of first to bottom of second 35 inches, and so on to 17 feet 3½ inches from the bottom. 6 checks in all.



JOINT OF INNER HOOPS.

Before setting up studs decide upon position of portholes; these to the number of three, if the first is in the second row of plates or four, if the first is at ground level, must be vertically above one another, and should be so located as to make the transport of the silage to the feeding place as easy as possible. The first stud to be erected should form one side of the row of port holes. The port holes need not be in line with ridge. They may be at any part of the silo.

The studs are fixed to the hoops on the flat, every fourth one coming opposite a foundation post to which they are bolted with two 8½ by ½ inch bolts passing right through the studs, treble hoops and posts. The intermediate studs are bolted to the treble hoops with 4 by ⅜ inch bolts. The bolts are all inserted from the inside, keeping the nuts on the outside for access when screwing up later on. The spaces between the studs except at the port holes, are 13⅛ inches clear measured between the inside edges of the studs. Cut a template 13⅛ inches long using it as a gauge to correctly fix the studs. Drive a 4 inch nail three inches above the centre of the third hole from the bottom of the stud. When erecting stud, let it rest by this nail on top edge of upper triple hoop; then nail stud to

treble hoops with two 3 inch nails at each. These will hold stud until ready to bore for bolts. It is well to try every fourth stud with a sheet of iron to see that lap comes correctly. Following these directions, the whole 32 studs are erected, the last, however, being put up 22 inches distant from the first instead of 13½ inches; this is to leave space for the port holes. The distance between the last stud and the last but one will be less than 13¼ inches. For the purposes of the roof, put two 24 feet studs opposite one another and attached to foundation posts. Place the 4 other 24 feet studs at the third stud position each side of these two.

The next operation is the putting on of the single hoops. These are alternately on the inside and outside of the studs, the inside hoops taking the horizontal lap of the sheets of iron forming the lining and falling into the checks made as already described. At the top of the silo the last hoop is kept on the outside, there being no horizontal joint to make tight. First put on a single hoop between the two treble hoops. Next put on the others carefully adhering to the following directions. Mark the hoops for positions of studs before putting up, by bending them round on top of the upper treble hoop and against the outer faces of the studs. The hoops should be fixed to the same studs as marked. This need not be done for each hoop, every fourth one will be sufficient. Unless this is done carefully, the silo will most likely have different diameters at different points and trouble will ensue when putting on the lining. The outside hoops should lap over so as to cross two adjacent studs. They are secured at each stud with 2½ by ⅜ inch bolts and at laps with 3 by ⅜ inch at first stud of the lap and 3½ by ⅜ inch at the last one, there being a plate washer 5 inches by 1½ inches by $\frac{3}{16}$ inch with ⅜ inch hole in centre at the end bolt. The inside hoops are scarfed 3 inches for a length of 3 feet 2¼ inches to cover three studs and butted, see sketch, and they are fastened to the studs with 2 inch nails. Care should be taken not to have the joints vertically above one another.

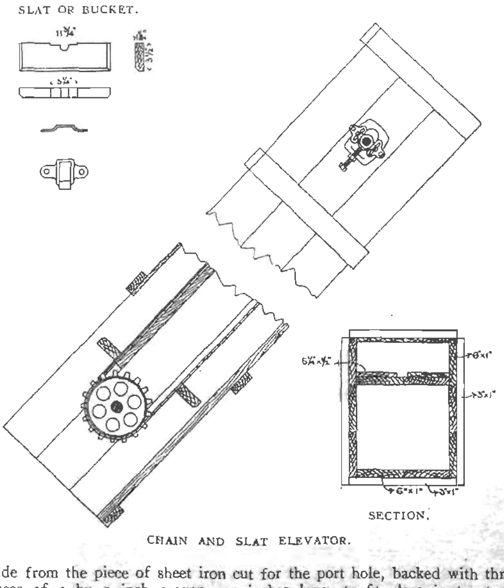
Short pieces of 4 by 2 inch hardwood are put in between the portholes and between the porthole studs alongside row of portholes. Nail short pieces of 3 by 1 inch for the width of two studs opposite to the inner hoops: these will serve as a ladder for access to the top and the portholes.

The Lining.—Six feet by three feet 24 gauge galvanized flat iron is used, tarred on one side as already directed. The tarred side is kept on the outside against the studs. If the studs and hoops have been erected as described, the sheets will have a lap of 3 inches vertically on the studs and one inch horizontally on the hoops. Carefully press the sheets out to the line of the circle before nailing, and start at the centre stud working out to the side stud. This will make the iron set better. Nail with 1¼ inch clout nails on the studs. 3 inches apart at the laps and 6 inches on the other studs. Nail with ⅝ inch clouts to hoops at horizontal laps, putting clouts ¼ inch up and down alternately to avoid splitting hoop. The upper sheet in each lap is put outside the lower to keep the weather out and prevent rain working in.

The Roof.—Bolt two purlins, 20 feet long, to the centre 24 feet roof studs at the top, letting purlins project in order to attach block and tackle, if required. Centre purlins are bolted to the third studs each side of ridge studs, which are 24 feet high as directed and bottom purlins are bolted to ordinary length studs—the sixth from the ridge studs. The centre purlins are fixed to suit the pitch given by the ridge studs.

Cover with 9 feet sheets of 26 gauge corrugated galvanized iron, allowing a lap of one and a half corrugations, with spring head nails at every third corrugation. Fix three lengths of 14 inch galvanized ridging. Fix four battens from studs to ends of bottom purlins for supports.

THE PORT HOLES.—Port holes are made in every alternate row of iron, the sill of the first being preferably at the top of the first inside hoop. The sills are made of 6 by 1 inch hardwood, as shown in the drawing, fixed to the top of an inside hoop and supported on two short pieces of 4 by 2 inches nailed on to outer face of studs. The sides are formed by four 2 inch pieces planted on studs, notched for ends of outside hoop and secured with two 4½ by ⅜ inch bolts. The stops are 3 by 1 inch hardwood set 1 inch back from the inside face. The doors are



CHAIN AND SLAT ELEVATOR.

made from the piece of sheet iron cut for the port hole, backed with three pieces of 3 by 1 inch oregon, 22 inches long, to fit close in to stops. They are held in position by the pressure of the silage.

THE ELEVATOR.—The length of the elevator will vary with the local conditions, whether the ground is sloping, whether the cutter is mounted on a stage and so on. In general, the length necessary is about 27 feet. A box having sides made of three 6 by 1 inch tongued and grooved flooring boards with top and bottom floors of two similar boards, with a

cover of 6 by ½ inch lining boards is all that is required. The sides and bottom floor are secured by cleats of 3 by 1 inch oregon at 6 feet distances. On the upper floor, which is 5 inches below the upper edge of box it is advisable to nail two 6 by ½ inch boards cut down to 5½ inches to form a groove for the chain to run in. The adjustable bearings sent with the elevator chain, slats and sprocket wheels are attached by bolts. The end of the box is put in as far as possible below the chaffcutter, and a shoot made with pieces of sheet iron or of wood to connect to cutter, the whole being boxed in as far as possible. The drive from the cutter will send the slats up the top or the bottom floor according to the side fed from. Looking towards the silo, if the feed be from the right hand, the elevator will work up the bottom floor. This is the most advisable, as the throw of the cutting wheel is then assisting to run the cut stuff down into the foot of the elevator. It will, however, work satisfactorily, feeding from the other side, so that the cutter may be put where most suitable for feeding.

The following is the list of material required for the 60-ton silo specified. Some of the items are slightly in excess, in order to meet contingencies :—

Red gum, 8/6, 8/5, 8/4, 6 x 4.
Hard wood, 6/24, 20/21, 1/20, 2/18, 7/16, 4 x 2.
Hard wood, 60/18, 6/12, 6 x ½.
Hard wood, 2/16, 3 x 1.
Hard wood, 1/8, 6 x 1.
White deal, 10/10, 10/20, 6 x 1, T. and G.
White deal, 8/14, 6 x ½, T. and G.
Oregon, 4/15, 3 x 1.
Iron, galvanized sheets, 56/6, 36-in., 24-gauge.
Iron, corrugated galvanized sheets, 16/9, 26-gauge.
Iron, 14-in. ridging, 3 lengths.
Nails, 2 packets, spring head.
Nails, 12 lbs. 1½ inch clout.
Nails, 3 lbs. ⅝ inch clout.
Nails, 1 lb. 4 inch, 4 lbs. 3 inch, 7 lbs. 2 inch, 3 lbs. 1½ inch.
Bolts, nuts, and washers—

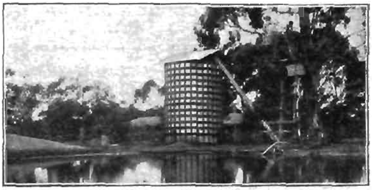
16	9½ x ½ in.	8	5½ x ⅜ in.
16	8 x ½ in.	12	4 x ⅜ in.
8	6½ x ½ in.	72	3½ x ⅜ in.
8	2½ x ½ in.	42	3 x ⅜ in.
2	6½ x ⅜ in.	194	2½ x ⅜ in.

Plate washers, 24/5 inches by 1¼ inches by 5-16 inches with ⅜-in. hole in centre.
Tar—8 gallons, with long handled brush.
Elevator gear.—54 feet chain, 1 9-16 inches pitch, with 27 oregon slats 11¾ x 3¼ x 1⅛ attached. Two 8¾-in. sprocket wheels, 17 teeth, with 18½ and 26-in. spindles, 1½-in. 4 adjustable bearings, 1 12½-in. 27-teeth sprocket wheel. 1 5-in. 10-teeth sprocket wheel. 10-ft. chain, 1½ inches pitch.

The cost may be computed from above list. The present contract price for all the above is £30 2s., but the operation of the proposed tariff which is still under discussion, has raised the cost 27s. mainly on the iron items. The cost may now be set down, on trucks, Melbourne, at £31 10s., of which £5 8s. is for the elevator. With an experienced builder assisted by three handy men, the whole work of erection, including construction of elevator, should be completed within four or five days. After the silo has been erected some time, and the greenness of the wood considerably lessened, the whole of the woodwork, and in any case, the lower 3 feet, including both treble hoops should be tarred, the tar being applied hot. The inside of the iron should be lime-washed as it is nailed

on. Supports, such as blocks of redgum, bricks, &c., should be put under centre stud in each bay, and it is as well to put such supports under every stud except those, of course, bolted to the foundation posts. To guard against risk from exceptionally heavy winds, a No. 8 black wire may be run over each slope of roof above bottom purlin, and fastened on to a convenient hoop. It is advisable, also, to stay the whole silo with three or four guys made of twisted No. 8 wire, taken well out from the silo, so as not to be in the road when carting in. These stays are of most service when the silo is empty.

To raise the height of an existing silo, the new studs should be halved for a length of about 2 feet, and bolted on to the existing studs on their edge, so that they show the narrow instead of the flat face to the iron. They should be bolted with two 4 by ⅜ inch bolts. This will allow of boring and fixing the new studs without removing anything except the roof. The hoops close to the ground must not be covered with earth; they are an essential portion of the structure, and should not be weakened by rot or white ants. The floor may be the earth levelled off, or a concrete floor may be put in as described in the July number of the *Journal*.



A SILO IN THE MALLEE.

SILAGE NOTES.

A New Source of Material.

A. S. Kenyon, C.E., Engineer for Agriculture.

There are many sources of material for the making of silage. Thistles, grasses, and weeds of all sorts are well known as silage makers, but the swamp reed, *Arundo phragmites*, has not up to the present been utilized. The greener portion of the reed, which grows all over the State, in lagoons, billabongs, and swamps, has always been known to attract animals, but it was not generally considered a valuable fodder. Last year a sample of the whole reed taken from Launching Place, Upper Yarra, was analyzed, and gave most surprising results. The following are the figures compared with those of a typical maize. It must be borne in mind that the quantities given are gross, their nutritive values being considerably less.

	Per Cent.				Carbo-Hydrates.	
	Moisture or Water.	Ash or Mineral.	Ether Extract or Fat.	Protein.	Crude fibre.	Nitrogen Free Extract.
Reeds	59.6	2.2	1.2	3.0	15.3	18.6
Maize	73.7	1.6	.9	2.2	6.5	15.1

Attention was thus directed to their utilization and an opportunity occurred of making a practical test. At Mr. Justice Hodges' farm, at Carrum, on drained land still growing reeds in profusion, a silo was erected and filled with the reeds. A considerable growth of grass was cut with the reeds, the lower portions of which for about 12 inches in height were very hard and dry. Separate samples were taken and analyzed with the following results:—

	Per Cent.				Carbo-Hydrates.	
	Moisture or Water.	Ash or Mineral.	Ether Extract or Fat.	Protein.	Crude fibre.	Nitrogen Free Extract.
Mixed grass and reeds as filled	53.4	4.9	.0	4.2	15.0	21.6
Lower portion of reed stalks ...	41.0	2.5	.5	2.2	21.6	32.2
Upper portion ...	56.7	6.4	1.1	4.3	10.9	20.7
Reed silage ...	40.8	6.1	3.2	4.1	20.8	25.0

The last line gives the resulting silage sampled some time after filling.

It will be seen that the Carrum reeds give even more favorable figures than the Upper Yarra ones though this is no doubt largely due to difference in the season at time of cutting. As to the actual value in feeding, let the manager's report speak for itself. Here it is:

"I filled in about 60 tons of reeds, and commenced to cat back at once. *The cows eat the silage readily and milk better than when fed on bran and chaff.* I fed about two-thirds silage to one-third of chaff, mixed together and well steamed. There was no waste until I got near the bottom, when I lost about 6 inches round the side; but I think I can overcome that in next filling by closing up all joints with carbon paint to entirely exclude the air. I am thoroughly convinced that for a cheap and nutritious food, you cannot beat the reeds growing in this district. I intend to fill the silo to its fullest extent. Others have seen the advantage of it, as the results have been watched closely. I am more than pleased, and intend to go on with plenty of reeds and maize silage for a winter food."

Reeds may be kept growing in partially reclaimed land by ploughing or cultivating after cutting. Without that, continued cutting or grazing will eventually kill them out.

FIFTH CONVENTION OF THE VICTORIAN CHAMBER OF AGRICULTURE, JUNE, 1907.

(*Continued from page 574.*)

VII.—BREEDS OF SHEEP INFLUENCING LAMB-RAISING.

H. W. Ham, Sheep Expert.

The reports on Australian export lamb of last season were on the whole favorable to Victorian shipments. Complaints were made that there were sent a good few quite second-rate carcasses, sheep-like, with too much merino type in them; some lambs, too, were under normal standard. It has also been recently stated that Australian lamb does not look as well frozen as that of other countries. There are certain shapes and breeds of lamb that never can be made to look well, no matter how fed, and this trouble can be remedied more by the flock-owners than by the people who handle the carcasses. In view of these reports we have to take into consideration the various breeds chiefly concerned, commencing with the merino.

MERINOES.

With the exception in some districts of the pure-bred flocks of English breeds, the merino is the chosen sheep of Australia, and his influence is seen for better or worse in all our crosses of sheep. Merinoes are valued chiefly for wool producing, and mutton is secondary. There are a few breeders who pay strict attention to the shape of their sheep, and this point, as will be shown later on, has the chief bearing on our being able to raise export lamb of the shape and quality to compete successfully with other countries. The merinoes are seen to best advantage in districts with a fairly light rainfall, and when care is shown in keeping an eye to depth and width of girth, they are found to hold out in droughts, and to travel well to water and to railways and markets. When experience and care are exercised in breeding them for wool, they are the most profitable sheep for making the best use of areas of country distant from railways and markets, wool being light in carriage and valuable in small space as compared with other produce.

It is as well to see how the late controversies on "plain *versus* wrinkly" merinoes affect us, for as before stated, the merino is our foundation stock, and must be considered. There are breeders who favour merinoes of the foldy type, and you will notice that the breeders who are most successful with this type of sheep are wide awake to the fact that width of frame is to them of great importance. To come to technical points, it is fullness of girth and a level and even shoulder that are watched for in individual sheep; this really means constitution, but there are two classes of constitutional shape, and we will consider later which class has the best influence from an export point of view. The second class of constitution is found in the wide and deep chested, high-withered section; he is usually more leggy, is not made prime so quickly, but can stand any amount of long-distance travelling, privation and hardship. It will be seen that, if merino breeders overlook this fullness of girth and level shoulder, and produce the narrow, sharp-shouldered class, our efforts to turn out fleshy lambs from ewes bred from crosses from these sheep are greatly affected.

Now it is not because a sheep is foldy that he is bad, for if he has all the recognised qualities of fleece and is above all a thriver, then

he is the most valuable to a stud breeder, but if he be not a good thriver then he is a curse to any man. Many of our foldy sheep look good girthed, but you will often notice they are filled out with folds, and if these were removed they would be very narrow, and here is where many breeders have been trapped. These folds should be watched for as standing outside the level from arm to sides. The plain-bodied class of sheep, and it is difficult to draw the dividing line between folds and plainness, is more easily managed, and needs a deal less attention. It is the widest established class, and considering the number of owners, large and small, engaged in sheep-breeding, it has perhaps the greater number of fanciers. Some breeders of this class are turning out very useful sheep, level made and profitable wool-cutters, just the class to be of great benefit in crossing later on for export lamb trade, but still there are used annually many thousands of rams and ewes of this class, light and bony in the fore-quarter, wedge-shaped, and when inspected the first impression is that they are light cutters, and that it is taking them all their time to grow well what wool they have.

From the better class of merinoes we get the greatest value in our cross-breds; level shoulders, good girths, and good fleeces can be bred as well from descendants of the foldy studs as from the plain. Extremes of either should be avoided. The few recognised breeders of foldy sheep breed plain ones, and the breeders of smooth-bodied sheep show us their best with deep neck folds, and full thighs, and by the time the flock sheep from these studs and others influenced by this style of sheep, are at prices within our reach, we find them very suitable for our purposes of crossing. With the cull sheep from either type, whether foldy or plain, we can expect very little satisfaction; they are, in the foldy type, wrinkly and yellow fleeced, and worse still, bony and narrow; whilst the culls of the plain-bodied type are mostly wasty and thin woolled, bony and wedge-shaped, although perhaps the better thrivers of the two.

Merinoes to be of greater assistance toward export lamb, should be less bony than we are accustomed to, and as full girthed as we can get them; in short, we want them level shouldered, good thrivers, and fair wool-cutters.

Lincolns.

Although of the opposite grade of wool the Lincoln must be considered our next greatest wool producer, and for crossing on the merino for wool and carcass purposes it must be given the choice of place. In good country with heavy rainfall this sheep succeeds. The Lincoln fleece lies like thatch on a stack and with its natural grease keeps out heavy rain, when with the shorter stapled and more upright woolled breeds it goes in. We have considered merinoes from the view of shape and constitution, and next to the merino the Lincoln, with many breeders, has also been neglected in these respects. Some breeders when selecting their sheep for breeding purposes pay most attention to wool points, and covering of fleece, and do not give the consideration to good girth and level shoulders that others do, and so it is that with inferior Lincolns as with inferior merinoes we find this narrowness of girth and fore-quarter giving a bony shouldered bad doer, quite opposed to the first principles of correct freezing lambs; and if this class of Lincoln be mated with the same class of merino ewes, what hope is there for good results? The Lincoln as bred by our best breeders is undoubtedly the best cross on merinoes for the better grazing areas with fair rainfall, close to railways, where it is found desirable to combine wool-growing with fattening. They are often spoken of as bad sheep as

weaners, but in the class of country just mentioned there is often more or less worm and other troubles natural to country with reliable rainfall, and when this breed and its crosses are bred with the view to constitution, they will be found to do as well as any other; it is well known that robust-shaped good constitutioned sheep will throw off more of these ailments than the narrow ones.

The crosses of this breed with merinoes make ideal wethers, and the Lincoln-merino ewes when joined to the right class of ram throw suitable lambs for the export trade; so apart from the object in favorable seasons of getting the lambs of this cross away as freezers, there is the later object to be gained by wool-growing and fattening the wethers and selling the ewes to farmers and others for fat lamb raising, which in itself is becoming now almost as profitable to the grazier as the actual fat lamb business.

The ideal ewe for the small grazier and farmer is the three-quarter bred Lincoln or Leicester. This ewe crossed with a good shaped Shropshire or Southdown, produces the ideal lamb, the three-quarter bred ewe having size and good milking properties, and the Shropshire giving the thickness and quality of flesh and early maturing properties. If a good fleeced Shropshire be used a good fleece can be grown as well, by those who can keep their best ewe lambs each season to follow on with. So now it appears that there is room for all three classes of sheep, Merinoes, Longwools, and Downs; and that it is not so much a matter of breed, as it is the shape of the sheep used. We hear breeds of sheep condemned to-day by men who have tried them unsuccessfully, and next day you meet men who are making a success of those very breeds, and who are running down other breeds. It is our fault, and not the animals, half the time; we bring them in for a purpose for which they are unsuitable.

Lincolns, Merinoes, and their crosses are really graziers' sheep and not so much farmers', but of course it is hard to draw the line between a grazier and a farmer for many farmers are both, and here it is that a man must judge for himself. If he is in any doubt of not being able to get off his crop of lambs for export annually, then he is better with the Longwool crosses and not the Down crosses, for it is impossible to supply the demand for good fleeced, correct shaped, clean skinned sheep at present; so many ill shapen, black and brown faced culls are about that the Shropshire breed is now suffering for its rightly earned popularity, and it is now becoming the same with Lincolns and Leicesters, anything that will pass for these breeds in name is being used to catch the profit passing. One thing we should try to do is to keep all our best shaped and fleeced ewe lambs each season, say 30 or 40 per cent. It is perhaps not possible for every farmer to do it, but with many it is, and it is done mostly by those who take pains to select the best ewes and rams they can to start with, for they cannot buy as good ewes as they can breed themselves by this means.

One thing that seems to be promising in Victoria is, that we are not likely to get so badly off for suitable ewes for raising good lambs as the New Zealand farmer has been. The demand for rams of the Longwool breeds by large land-holders points to the fact of there being a better supply of the right class of ewes for the farmer. We have a large number of land-holders, in Northern Victoria and Riverina, who are not likely again to try Shropshires, as they are in a climate that is inconsistent, and it is safer work for them to go into Longwool breeds; when the season is favorable they have a good export lamb, and when otherwise they have a good wool cutter. As the farmers who grow artificial crops of rape,

&c., increase, the demand for the half-bred and three-quarter ewes will increase also, and so this demand, brought about by the freezing trade, will counteract the sole objection to these coarser grades that existed before, viz., growing a wool that was often of low value.

ENGLISH AND BORDER LEICESTERS.

These breeds of sheep and their merino crosses come next from a grazier's point of view of wool producing, and now we get into breeds of sheep that have been bred by our English fathers with the view to shape of carcass first and wool second. This is one reason why the larger grazier who relies on natural pasture to get his lambs away, is beginning to value these two breeds. They are level shouldered and good girthed naturally, and good thrivers consequently, and being clean faced and legged, and tall lengthy sheep, are good travellers for water and feed, and to market. They are fairly early maturing as lambs, perhaps a little leggy, and if anything rather inclined to more fat in proportion to the lean than the Down breeds. As a rule, they are finer in grade of wool than Lincolns, and consequently finer in grain of mutton, but not so fine and firm as the Downs. The Border Leicesters are not quite so well covered from a wool view as the English Leicesters, but are generally finer in grade of wool, although when the influence of the ewes they are mated with is taken into account, there is but very little to choose between them for the lamb-raiser. These are two breeds that are very suitable indeed for the graziers and the larger farmers, who mix farming and grazing. The crosses by these breeds are good wool-cutters, and very hardy; the secret of their thriving and hardiness is the inherited thickness of ribs and girth especially.

At the present time there are to be seen many sheep called by these breeds that have no right whatever to the name, although perhaps pure bred and pedigreed. They are wretchedly shaped and as badly fleeced, having shallow fore-quarters, and being thin and wasty in the wool. These much to be desired breeds are now coming to the same thing that has brought the Shropshire a bad name; we must have shape and fleece both to succeed. Better to have a good shaped and fleeced sheep of any grade or cross for lamb-raising than be tempted to take an inferior weak girthed one of a fashionable breed for this reason only. These pure and pedigreed ill-shapen rams are the most dangerous of all, usually throwing truer than grades, and consequently throwing more ill-shapen offspring, whereas in actual practice a well-bred grade of correct shape throws better and more even lambs.

SHROPSHIRES.

Of the Downs breeds the Shropshire is the better fleeced, and has the advantage of being in grade of wool between the Merino and Longwool, although of not the same style and character. The chief desire of the breeders of this sheep has been to maintain quality and firmness of flesh, and to have lean meat greater in proportion to fat, at the same time encouraging early maturity and ability to thrive; and further in regard to wool, to maintain it at a medium grade, and to cut as much as could be made possible without neglecting these other good qualities. Of late years there has been a desire to breed Shropshires to what was termed suiting Australian conditions; that means more wool and better covering. A few of our best breeders raised a sheep with a very woolly head and well covered arm and thigh, &c., and still kept a strict look-out not to neglect girth and

shape, but many new breeders were led astray by this; they saw only the woolly head and other show points and forgot to watch the thin neck and weak shoulders that were creeping in, and now the country is overrun with dark-faced sheep of all shapes—anything with the least appearance of the colour of a Shropshire was sold as such.

There is no doubt that as a farmer's sheep for using on crossbred ewes too far advanced towards the coarser breeds these Shropshires give every satisfaction for export lambs, but they must be of the right shape. Shropshires when fat are not good travellers. With the small farmer this breed will be found very necessary later on when a large proportion of three-quarter-bred ewes is available. When getting towards pure, these three-quarter ewes, if crossed with pure Longwools again, will throw lambs too coarse in grain of mutton, especially if kept over the milk lamb stage, and are inclined to lay on fat more in proportion to lean. If coarse grades of wool become of low value again, good fleeced and shaped Shropshires are the best cross to bring about a medium grade of wool, and at the same time keep early maturing properties and quality of flesh and shape.

SOUTHDOWNS.

These neat and very early maturing and quick thriving sheep, have not as yet come into favour as they deserve. They are particularly suited for farmers on second-class country close to markets, are especially well able to throw off diseases if given any liberal treatment at all, being of all breeds the best constitutioned. They are rather small, but are very weighty and are plenty large enough for poor country. They cross to perfection with Lincoln and Leicester cross ewes that have been bred too coarse in the wool and flesh. That the demand for this breed, of correct shape and fair fleeces will grow is assured, and will increase as the Longwool breeds are more used and there comes about a larger number of the coarser sorts, for wool itself of the coarser grades must some day be again of low value. Small farmers cannot have the merino ram even if of good shape, as his lambs are slower maturing. It is the quickly grown milk lamb that pays the average farmer best, and the export people can make it look to perfection also. In addition to this it brings the best price on the home markets.

SELECTION OF STOCK.

Rams.—When full woolled and fat, rams with a tendency to narrowness and bony shoulders are not so easily detected. A ram for the purpose of fat lamb-raising should always be handled to see if he is full girthed and even fleshed; the easiest thing to find is the high sharp shoulders. Judgment must be used, and the condition and treatment of the sheep allowed for. In plain merino rams a fair idea can be gained by outward appearance when walking at a little distance, but it is always wise to handle them. In stud rams, folds filling up the narrowness behind the arms must not be mistaken for width of girth. In Longwools, rams should be handled as the wool, especially in flock rams, will part on the top of the shoulder and down the back, and being a long staple will hang over the sides, the locks overlapping one another and giving the sheep a round appearance. The wool, being open and thin on the back, gives the idea of being broad and level.

In Shropshires and Southdowns, especially the former, the sheep should always be handled. Their wool lends itself willingly to the

practice of cutting into shape, which is really dishonest trimming; the top of the shoulder and backs of these sheep are by some sellers levelled off with the shears, and the sides cut level with the forearm or thigh, giving the sheep a level and full girth appearance.

Care should be taken, but not too much attention should be paid to woolly heads and outward appearance. In flock rams, good girth is first—thick neck and level shoulders and good quarters are nearly always associated with it; clean bright skin, and a good useful fleece come second. Good leg of mutton, bone, head covering, colour, and the many necessary and valuable points in a stud ram that go to make a type, are not necessary to the lamb raiser. He wants the results of stud breeding as gained by constitution and not the fancy points; without the ability to thrive we can have none of these, for it all comes from the good use of the feed given, controlled by judgment in mating.

Ewes.—Good ewes in any class of sheep-breeding are half the battle, and indeed more so, for they have the rearing of the lamb after, apart from their influence in blood. We will be dependent on the larger grazier to a certain extent for a supply of the right sort of these in future. Correct rams without correct ewes are not sufficient; in ewes more so than in rams, it is, as before stated, not so much a matter of breed as it is the shape of the sheep used. Where possible, farmers should keep their best shaped and fleeced ewes; a ewe can grow a fleece to more than pay for her keep,and leave the lamb clear. The point is, when once you get good shaped and wool-cutting ewes why sell the best ewe lambs? Why not keep increasing the good qualities already procured?

Pure versus grade rams.—There is plenty of evidence to show that there are not sufficient of the correct shape pure breeds of English sheep to supply the demand for rams, and that grade rams of every breed are being extensively used, and further we often hear it advocated to use only pure sheep. Why a good pure bred sheep is so valuable is, that he will throw truer than a grade, and this being so, and we are forced to use badly shaped and fleeced pure ones, then it is evident that we cannot do anything much worse, especially so, if he be descended from another bad one before him; but on the other hand, if a grade ram is of good shape and fleece, and he is well bred, that is, comes from sheep of good form and good cross, in practice he will give the best results.

MILK LAMBS.

The object that appears most desirable at present is, that lambs should be ready for freezing just as the ewe is beginning to go off milk. With many this has to be assisted by growing rape and other fodder crops, according to the class of land. These lambs can be made from 30 to 40 lbs. weight at from 4 to 5 months old; they are then the most valuable for the time kept and the fodder eaten, and in reliable rainfall districts they should be lambed so that the farmer has the assistance of the spring months to help with artificial crops. In no case should a lamb suffer a check. Keeping the ewes in good heart, lambing the lambs strong, and using the searing iron, marking as young as possible, are now recognised as assisting to get the lambs to the required weight while on the mother. With the attention that should be given to shape rather than to breed, the adoption of the methods just mentioned, and the increasing custom of sowing green fodder crops, we will be able to send off a quality quite equal to best Canterbury and what is of as much importance also, a more consistent supply, which we could not rely on from natural pastures.

CONDITIONS SURROUNDING THE EXPORT TRADE IN LAMBS.

A. A. Brown, M.B., B.S., Inspector of Foods.

Lambs killed in Victoria for export are procured from widely scattered and distant sources. Many come from the Riverina, the Wimmera and the Mallee, and also from Gippsland and the Northern and Western Districts. The slaughtering of lambs for export is conducted at Casterton, Geelong, Hamilton, and Portland, and in the Metropolitan area. All these places are remote from the source of origin of the lamb, and the situation of the slaughtering establishments has much to do with depreciating the value of the lamb for export. Perhaps very few shippers appreciate the significance of the fact that much damage is done to the lamb by the long journey it has to make to reach its destination. In tracing the movements of lambs from the pastures to the abattoirs we see much that causes the lambs to fall away greatly in condition. In the first place they are travelled on foot, distances more or less great, to reach the railway trucks. They are then transported over a long stretch of railway, generally under a burning sun, to the abattoirs, and two or three or even more days may elapse before they reach their destination. Young lambs suffer more seriously than older animals by the long journeying. Lambs taken from the pastures and travelled far fret very much, become depressed in health, lose weight, and part with their bloom. Lambs after such treatment, on being slaughtered, do not present so bright an appearance as those killed within a few hours after removal from the pastures. In New Zealand there is quick transport from the pastures to the abattoirs, and, therefore, in that country, lambs and sheep are killed before there is any appreciable loss of weight, and before the bloom has passed off them.

Fodder Crops.

Another cause operating to produce superior lambs in New Zealand, to those generally raised in Ausralia, is the attention that is paid to the raising of special fodder crops, and to the proper feeding of sheep for export. From the time the lamb is born until it reaches the slaughter-house, it should receive no check to its development. The lamb must thrive from birth and become prime in the shortest possible time, and this is achieved by supplying abundance of food. In New Zealand, as soon as the lambs become prime, they are sent off in little lots to the freezing works, and no chance is allowed of their receiving a set back. In Australia as a rule, the sending away of lambs in little lots, is, as yet, beyond the bounds of practicability, since the abattoirs are so far away from the farms on which the lambs are raised. In Victoria, however, I feel convinced that in many districts it is quite practicable to send lambs away in little lots to the abattoirs as soon as they become prime. By following out this practice there is no chance of the lambs receiving a set back. It should be remembered that when a set back is received it takes the lambs a long time to recover their former condition.

Well fed mothers produce prime lambs with a beautiful bloom. The bloom cannot be got on the lambs if the mothers are scantily fed. There is no question that if more attention was paid by graziers to the growing of special fodder crops, lambs superior to those produced in any other country in the world could be placed on the London markets by

Australian graziers. But in the matter of providing ample, succulent, and nourishing feed, we find graziers very neglectful, and consequently they cannot expect to obtain high prices for indifferent lambs. Fat lambs fetch high prices and so it pays to grow special fodder crops to feed them. Well fed mothers always produce good lambs, and, if the mothers are not sufficiently fed, it cannot be expected that they will furnish the quantity of milk necessary to keep the lambs in forward condition.

In certain districts, and at certain seasons, our lambs are likely enough to get very much damaged by grass seeds, and until holdings become smaller and special grasses and fodder crops are generally grown the mischief will prevail. Carcasses damaged by grass seed lose their bloom, and consequently their value is greatly depreciated. Every year large numbers of lambs are rejected for export on account of injuries sustained by grass seeds. Nature provided for the pioneer pastoralist of Australia, wide tracts of salt-bush, and there are two dwarf varieties (*Atriplex semibaccatum* and *A. vesicarium*) which rank amongst the best of fodder plants for sheep. There has been ruthless destruction of these valuable plants and even now it is not yet too late for pastoralists to retrace their steps. Nature has indicated to us the drought-resisting properties of the salt-bush family, and I have seen salt-bush growing in seasons of drought when practically all other fodder plants had perished. The best salt-bushes to feed sheep upon are the two dwarf varieties mentioned. They approach lucerne as regards their feeding value; lucerne has a nutritive ratio of 1 : 2.5, and dwarf salt-bush has a nutritive ratio of 1 : 3.9. Two of the best kinds of the taller salt-bush to grow are the *Rhagodia hastata* and *Atriplex nummularium*. In arid districts particularly salt-bush should be extensively planted and if the plants receive care, they will prove of untold benefit when bad seasons come. Not only in arid districts but in every district salt bushes should be grown and fostered, since they are anthelmintic or worm expelling in their properties. Salt-bush country is splendid for sheep, and the salt-bushes, along with natural grasses, will produce excellent lambs.

Special fodder crops are absolutely necessary for getting lambs into prime condition as rapidly as possible. The growing of special fodder crops which is a marked feature in New Zealand husbandry, is not yet extensively practised in Australia, where the condition of the lamb is allowed to depend almost entirely on the seasons. The vagaries of the seasons exert an influence on the fodder crops, as well as on the pastures. Wherever, then, rainfall is certain, or irrigation possible, fodder crops should be extensively grown. Besides the indigenous dwarf salt-bush there are certain exotic fodder crops eminently suitable for fattening sheep, and in districts where such can be readily cultivated, every endeavour should be made to establish them. Lucerne is one of the best of fodders for fattening sheep. Rape which has a nutritive ratio of 1 : 5.7 is *par excellence* a late autumn and winter fodder. Thousand headed kale (nutritive ratio 1 : 5.2), maize (1 : 12.6), turnips (1 : 7.7), and mangolds (1 : 5.1), could be grown in favorable situations. Prairie grass, which springs up early in autumn and grows splendidly in the winter and early spring, is a capital fodder for sheep, and so also is the *Phalaris commutata* which provides prolific feed.

There are only a limited number of plants suitable for winter fodder in the northern districts of Victoria, but cereals, if put in early and the sheep allowed to graze over the paddocks, will give excellent results.

Towards spring the sheep should be removed, the harrows put over the field, and the crop allowed to come away. Maize and millet are excellent summer fodder crops to grow, if conditions are favorable. It is not possible to lay down permanent grass pastures in the arid northern districts. Grasses cannot withstand the prolonged summer heat or droughts. In any case exotic grasses are unsuitable. Permanent pastures, however, can be established by growing lucerne and salt-bush and thereby the stock carrying capacity of the land will be increased. In the southern and western districts permanent pastures can be established, and a mixture of grasses that will provide succulent food throughout the greater part of the year should be sown. This object can be achieved by sowing grasses that ripen at different periods; rye grass, prairie grass, meadow foxtail, meadow fescue, timothy, cocksfoot, crested dogstail, white clover, alsyke clover, and cow grass, will grow well and make a good pasture.

Importance of Shelter.

Another factor tending to produce deterioration in our lambs is exposure to cold and wet. As exposure makes great demands upon the animal economy, the flocks should be sheltered, if the best results are to be secured. One sees so few graziers providing shelter for stock. Belts of trees such as currijongs, bluegums, tree lucerne, and coral trees, should be established to protect stock from inclemency of season. Animals properly sheltered thrive well, and the vigour of their health is consistently maintained at a high level, and so their bloom is preserved. In New Zealand, the importance of shelter is fully recognised and shelter belts and hedges will be found on the various holdings.

Breeds.

Locality has a bearing on breeds of sheep. The climate of the southern one-third of Australia is more adapted for sheep for meat purposes than the northern two-thirds. Much has already been gained by actual experience as to the breeds that will thrive best in particular localities. The black-faced breeds are regarded as being the best for lamb export purposes. They mature early; fatten quickly, and are better adapted than other types to graze over artificial pastures or small holdings; also, if killed within reasonable time after removal from the pastures, they maintain their bloom longer. In Australia, a special type of sheep is not generally grown for export. Here and there only can it be said that lambs are specially raised to meet export trade requirements. The question may be put does it pay better to breed Down crosses or Longwools for export. In this connexion the skins have a great influence with the exporter. He likes the skins that give him the most value and he somehow looks upon the meat as a secondary consideration. Last year showed that any difference in price between lambs of the same weight and condition was due to the skin. Experience in Victoria shows that the breed or cross which gives the best weight of lamb in a given time, and yields a good skin is the one to employ. Contrary to previous experience the black face last year was of no advantage in selling lamb. The main points considered were condition, weight in a given time, and skin.

Animals from poor pastures do not furnish the same quality of meat as those from rich and sound ones. They may, indeed, in some seasons, appear plump enough, but there is not the solidity and weight in them as

in those from localities where the food is more nourishing. Climate has a great deal to do with the production of superior meat. The meat produced in a bracing climate is better than that produced in a hot district, all other things being equal. The tallow tests indicate that the New Zealand titre is higher than that of Victoria, Victoria higher than New South Wales, and the latter higher than Queensland. The special feeding practised in New Zealand, as well as the bracing character of the climate, accounts for the difference in the tests. In New Zealand special types are bred for the mutton and lamb trade. Lincolns and Leicesters and crosses thereof are raised extensively.

Slaughtering.

A little time before slaughter, sheep and lambs travelled long journeys should be watered so that dryness of skin may be avoided. When the skin is dry, the slaughterman is liable to tear the tissues beneath. Moreover there is an absence of bloom in the animal deprived of water, so particular attention should be given to the watering of stock.

Animals should be skilfully butchered, and the carcasses rapidly drained of blood. If thoroughly drained, the carcass presents a brighter appearance than when badly drained. The dressing should be carefully done. Removing the skin should be done with care so as to avoid tearing the tissues and thereby depreciating the carcass. When the skin is dry it is difficult to avoid tearing, so water should be provided. The washing of the carcass with clean tepid water by the butcher should be carefully done.

Chilling and Freezing.

The carcass should be thoroughly chilled before being removed to the freezing chamber. The operation of chilling requires care. Hot winds take off the bloom, so chilling rooms should be provided with shutters to admit of their manipulation to exclude them. The frozen carcasses should be bagged in clean material, and should not be roughly handled. Shippers should insist that the stevedores should exercise greater caution in the handling of carcasses and in their stowage in the ship's chambers; they should compel workers in the ship's hold to muffle their boots, since they must move over stowed carcasses in carrying out their duties. Many carcasses are damaged by the rough boots of the workmen. The freezing chambers on the ships should have smaller hatches for loading frozen meat, and means should be devised whereby the meat already stowed cou be protected from the hot outside air. Exposure by open hatchway methods as at present, damages the consignments.

It is a common report that superior Australia mutton and lamb are sold in London as of New Zealand origin, and that only average quality carcasses are disposed of as Australian. Firebranding the carcasses would get rid of this practice, but would lower the price for primest sorts, and the cost of inspection would be materially increased if it were made compulsory. The application of lead seals to the carcasses is an expensive matter, as experience in Victoria has proved. Firebranding, although adding to the cost of inspection, would not be as troublesome or as expensive as the application of lead seals; they could, of course, be cut away, but could not be placed on other carcasses, whereas the wires attaching the lead seals to the carcasses could be manipulated, if there was a desire to do so.

DISEASES OF FARM ANIMALS.

S. S. Cameron, M.R.C.V.S., Chief Veterinary Officer.

DISEASES OF THE FOOT.

Contracted Heels—Thrush—Canker—Sand crack—False quarter—Seedy toe—Pricked foot—Foot wounds—Quittor—Foot-Rot in Sheep—Foul in the Foot of Cattle.

The important diseases of the foot of the horse associated with some obscurity of lameness, *viz.*:—Sidebone, corns, laminitis, villitis, and navicular disease, have already been dealt with in the chapter on Lameness (p. 211, *et seq.*) There remain for consideration those diseases which are not necessarily associated with lameness, or in which the cause of lameness is patent, and there are also to be considered foot affections of cattle and sheep.

Contracted Heels.

This is an abnormal condition of the foot in which the heels become contracted or "wired in," the frog dry and shrivelled, and the growth of horn at the heels uneven, so that the coronets at the heel are not on the same level. (See Fig. 103.)

Fig. 103. Shod hoof with contracted heels showing shrinkage of frog. (After Hayes.)

Causes.—The primary cause of this condition is absence of frog pressure, brought about by injudicious paring of the frog, and improper shoeing. So long as the frog is allowed to come in contact with the ground some amount of pressure will be exerted on it through the weight of the animal; and so long will it continue to retain its proper size and

structure, and to perform its function as an elastic wedge to lessen concussion and maintain the heels apart. If, however, the frog is raised off the ground it ceases to perform its wedge function, and commences to atrophy and contract, the contraction being largely brought about by the side pressure of the heels. As it contracts the heels become approximated and curled in, so much that the frog may be lost to view. If, on account of the existence of pain, as in navicular disease, or for any other reason, the horse goes on his toe, there will be loss of frog pressure and liability to contracted heels. Sometimes actual lameness results, in which case the condition is an unsoundness (*vide* Greenway *v.* Marshall, Baron Pollock, Eng., 1845); and in most cases there is loss of freedom of movement proportionate to the extent of the contraction.

Treatment.—The remedy lies in proper and skilful shoeing, whereby the frog pressure is continuously maintained. In the early stages benefit may result by running the horse at grass unshod for a few months, or if work has to be continued an artificial rubber frog pad fixed to a leather sole may be used. There are many such frog pads patented. If the condition is at all advanced, and the frog much shrivelled, there is little likelihood of a cure, but the constant aim ought to be to have the foot so shod that the frog will come to the ground.

Thrush.

Thrush is the term given to a condition in which there oozes from the horn and fissures of the frog a foul-smelling irritant discharge. The condition is really one of inflammation of the horn secreting (keratogenous) membrane of the frog, whereby a softened and degenerated horn is formed, instead of the tough elastic horn which is natural as a covering of the frog. The altered horn has a cheese-like consistency, lacks coherence, and can be easily scraped off with the thumb nail or any blunt instrument; in severe cases it rots off completely, leaving the vascular tissues exposed and raw, so that rough contact causes them to bleed and ulcerate.

Thrush is an unsoundness, *vide* Barrett *v.* Preece, Shrewsbury County Court (Eng.), 1858.

Causes.—The most potent cause of thrush is exposure of the frogs to filth and damp. Neglect to remove the "balling" of horse dung or soiled bedding, tan, or sawdust from the shod foot is a fruitful source. Such substances quickly undergo a moist fermentation, whereby solvent fluids are formed, which at first moisten the horn and destroy its texture, and afterwards penetrate and inflame the subjacent tissues. Hence horses kept in filthy stables are most liable to thrush, and the hind feet are more often affected than the fore, because of their more continuous liability to contact with urine and dung. Paring of the frogs by farriers doubtless acts as a predisposing cause, both because of the exposure of immature horn and the abolition of frog pressure. The pernicious practice of "stopping" the feet with cow-dung or such like decomposable material is also responsible for many cases of thrush.

Treatment.—Diseased or loose portions of horn should be removed, and the degenerated horn scraped off. Then some drying and disinfectant dressing should be applied to the surface, and pressed into the fissures two or three times a day until the discharge ceases, and a healthy, natural-smelling horn growth is brought about. Calomel and powdered burnt alum are useful agents for this purpose, or an antiseptic wound

powder may be used. A mixture of equal parts of tincture of myrrh and butyr of antimony is a good dressing in the first stages of treatment. Thorough cleanliness is essential to a cure, which should be brought about in most cases within a fortnight. In severe cases, with rawness of the sensitive structures and ulceration, the part will in the first instance need to be treated like an ordinary wound.

Canker.

This very intractable disease is a sub-acute inflammation of the horn secreting membrane of the sole and frog, resulting in destruction of the texture of the formed horn, and in the formation of a soft cheesy-looking horn and fungoid granulations, from which exudes a foul-smelling, irritant, ichorous, and infective fluid. It is, in fact, an aggravated condition of Thrush, involving the whole of the ground surface of the foot, and is usually due to the same causes when acting intensely. The progress of the disease is slow and insidious, and not accompanied by much pain, but it is very persistent and difficult to cure. (See Fig. 104.)

Fig. 104. Hoof affected with canker. The disease has involved the frog and part of the sole at one heel and has extended to the coronet at the back. The diseased part is now a mass of spongy moist and foul smelling horn. (After Reeks.)

Treatment.—The essential point in treatment is the removal of all diseased horn and tissue of any kind, even to the extent of stripping the sole off completely. Strong antiseptic dressings of such substances as creosote, calcium carbide or corrosive sublimate are sometimes employed with success. Caustics, such as bluestone (sulphate of copper), bichromate of potash, or caustic lime may be used, but they are seldom in themselves permanently effective; nor is the application of the hot iron. Such treatment needs to be accompanied by sole and frog pressure applied by means of carbolized tow packings, or in some other way. In this connexion the records of a case I treated with full success some years ago may be profitably quoted.

The first procedure was the removal of every particle of diseased horn with the drawing knife, laying the horn secreting membrane bare all over. The paring of the diseased horn should be commenced at the part of the foot most dependent when it is held up, so that the unavoidable bleeding will be below the part still to be operated on. If this simple plan is not adopted, the removal of *all* diseased growth, on which success almost entirely depends, will be a matter of considerable difficulty. The exposed surface, especially the clefts of the frog, was then dressed with liquified crystals of pure carbolic acid. The horse was then placed in a shallow foot bath of partially slaked lime, the consistence of thin paste, and allowed to stand in it for from four to five hours daily for a week, his feet being dressed every alternate day with carbolic crystals. At the end of this time it was noticed that those portions of the frog and sole which had received pressure were much less congested and swollen; there was an

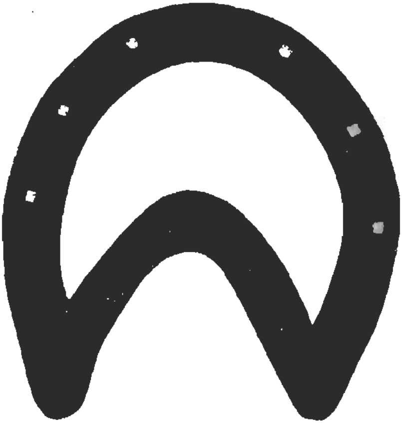


Fig. 105. Bar shoe.

absence of fungoid growths and cheesy horn, and the surfaces were hardened over and healthy in appearance. On the other hand, the sides and bottom of the V-shaped cleft between the frog and sole, on which no pressure had been exerted, were in almost as bad a state as ever, except that the foulness of the discharge was less marked, and evidently of a less irritant character. Taking the hint from this casual observation, it was speculated that the application of an even pressure to every part of the affected surface would have a salutary effect. Accordingly, a set of bar shoes, dished so as to rest wholly on the sound wall, was made and adjusted, the bar crossing from one heel to the other. The diseased surface having been thoroughly cleansed, painted with carbolic and dusted with zinc oxide, a plaster-of-Paris cast was run in level with the ground

surface of the shoe all round and allowed to set while the foot was being held up. This remained *in situ* three days before being removed, the horse standing on tan bedding meanwhile. The decrease of the excessive vascularity of the exposed parts was satisfactory, and the pressure treatment was continued for two weeks—a half-and-half mixture of Portland cement and plaster-of-Paris being substituted on account of the brittleness of the latter when used alone. The casts were removed every three days and the soles dressed with an astringent and antiseptic powder (carbolic crystals, zinc oxide, and calomel), and at each removal a gradual cessation of the fluid secretion and cheesy fungoid growths was evidenced. The soles and frogs dried up rapidly, and during the second week became covered with a dry layer of horny matter which seemed to be healthy and impervious to the slight discharge now issuing from the frog clefts. The astringent and antiseptic dressings were continued, and within a month the horse was put to work, and continued quite sound, and without new development of either thrush or canker.

Sand Crack.

By the term "Sand Crack" is meant a crack or fissure in the wall of the hoof, running vertically down from the coronet in the same direction as the horn tubes, and extending through to the laminæ and sensitive structures. They usually occur on the inside quarters of the fore feet and at the centre of the toe in the hind feet. Horses with brittle or shelly "hoofs" are much disposed to sand cracks, and in that sense heredity is a pronounced predisposing cause, such hoofs if shod unevenly, so that the pressure of body-weight is not equally distributed on all parts of the wall, sole, and frog, will readily crack during fast trotting on hard roads. Occasionally a sand crack is the result of a tread or injury at the coronet, whereby the proper formation of wall horn is interfered with. Horse-coper's tricks include the filling of sand crack with wax, putty, or other stopping, and showing the horse with mud-caked hoofs.

Treatment.—If lameness is pronounced, poultices of bran or cold water bandages should be resorted to for a day or two, and the crack should be carefully freed of all dirt and foreign matter, and made clean. The objects in curative treatment are to arrest all movement of the edges of the crack, and to promote a quick growth of solid (unsplit) horn from the coronet. For the latter purpose the application of small quantities of fly-blister at weekly intervals, or stimulating the coronet by touching it occasionally crossways with a firing iron are most likely to give advantageous results.

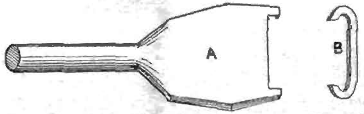


Fig. 106. Sand crack instruments. A, searing iron; B, metal clip.

To arrest movement of the edges of the crack various devices are adopted. An excellent method is what is known as "clasping" or "clipping" the crack. This may be done with the aid of special instruments

which comprise (*a*) an iron for burning notches on each side of the crack into which the hooks of the clips are introduced, (*b*) a steel clip made of narrow bands of steel hooked at each end, and (*c*) a pair of forceps for the purpose of fixing the hooks in the notches, and compressing the clip. A more ready-to-hand method of clasping may be performed as follows:—Cut a short notch with the drawing knife lengthways of the crack and on each side of it. Then drive a horseshoe nail in at one notch, so that it shall pass through the crack, and make its exit at the notch on the other side of the crack. Pinch off the head of the nail and clinch both ends tightly over the crack. Care must be taken that the sensitive structures are not touched when driving the nail. Three or four clips or clasps may be put in the length of the crack if necessary. In cases where the crack does not extend the whole way down from the coronet to the ground surface arrest of movement may be accomplished by isolating the crack. This is done by cutting or burning grooves on each side of the crack, commencing

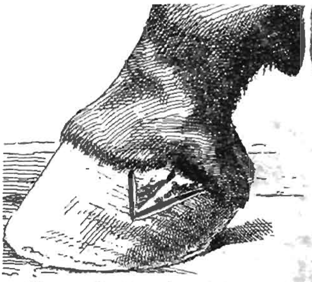


Fig. 107. Partial sand crack isolated by V-shaped groove cut in horn. (After Hayes.)

Fig. 108. Hoof showing sand crack on inside quarter clipped as described in text. (After Axe.)

at the coronet about half-an-inch on each side of the crack, and converging to meet at a point below the inferior extremity of it—a V-shaped groove, in fact, divided by the crack. The groove must be deep enough to reach the soft white layer of horn, so that it will "give," and, therefore, the horn it encloses be unaffected by concussion or body-weight pressure. The crack within the V may be clasped as described. (See Fig. 108.)

When the horn has commenced to grow unsplit from the coronet, about a year will elapse before it reaches the ground surface of the wall solid.

"The shoeing of a foot affected with sand crack requires some special attention. The shoe, in these cases, should be light, and in the case of a toe crack should have two clips, one on either side of the crack, but a little distance from it. The shoe must have a good solid bearing on the wall of the foot, but under the crack the horn should be cut out in a semicircular fashion in order to remove all weight-bearing from this part."—(*Wilkie.*)

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DISEASES OF FARM ANIMALS.

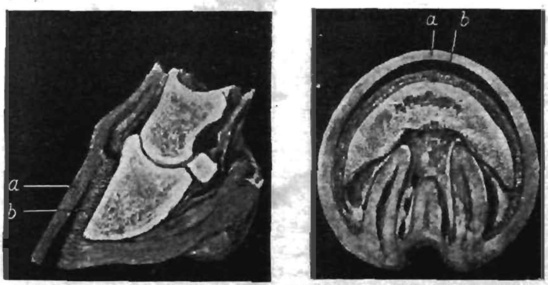
S. S. Cameron, M.R.C.V.S., Chief Veterinary Officer.

DISEASES OF THE FOOT.

(Continued from page 640.)

Seedy Toe.

Seedy toe is the name given to the formation of perverted horn at the union of the sole and wall on the under surface of the toe. It may spread round towards the quarters and heels and upwards towards the coronet. The horn appears structureless, soft, powdery, and easily scraped away.



Figs. 109 and 110. Seedy toe. Vertical and transverse sections of foot, showing the horn fibres (a) separated from the horn laminæ. (After Axe.)

The Cause is somewhat obscure and has been ascribed to the attack of a parasite; but the condition frequently follows on an attack of laminitis and doubtless is occasionally also caused by the pressure of an over tight toe clip.

TREATMENT comprises the removal of all the perverted horn and the application to the part of a dressing of tar or mixture of Venice turpentine and lard.

False Quarter.

This is a condition of the hoof in which portion of the wall is composed of weakened or improperly formed horn. It results from cessation of horn secretion at the coronet, the crumbly horn covering the part affected being derived principally from the sensitive laminæ. It is caused usually by a severe injury to the coronary band, such as may result from a tread or "quittor."

Treatment is not usually successful in completely restoring the normal horn growth. Blistering with fly-blister at intervals is most likely to effect this.

Pricked Foot.

Pricking of the sensitive structures of the foot is a comparatively frequent occurrence when horses are being shod by careless or unskilful farriers. The "quick" may be actually penetrated or the nail may be merely driven close to it. In both cases pain and lameness may be shown either immediately or in the course of a day or two. In cases where the pain is associated with the formation of pus (matter) the development of lameness may be deferred for a fortnight or more; so that it is not safe to eliminate a pricked hoof as a cause of lameness even when a considerable time has elapsed since shoeing. "The injury done by 'drawn nails' is generally more serious and always more difficult of detection and treatment than when the offending nail has been left in. A 'drawn nail' is the term used to denote a nail which, in the first instance has been driven in a wrong direction (inwards) and then removed."—(*Hayes.*)

The discovery that lameness is due to a prick often requires most careful examination. Tapping with a hammer on the clinches or on the ground surface of the shoe and applying the pincers to the crust and sole in the region of the nails, may cause flinching. On removal of the shoe the nails should be examined to see if any one is wet or stained with blood or pus. Sometimes a little pus will ooze out of the nail hole following the drawing of the nail, or the nail hole may be stained. Increased heat may sometimes be felt on the pricked side.

TREATMENT.—In all cases, but especially when there is suspicion of the formation of pus, the puncture should be pared out by following up the track with a drawing knife or searcher. This is necessary in order that any pus which may form or has formed may be allowed to escape. If the pus is kept imprisoned (and it cannot penetrate horn) it will, as it increases in amount, be forced upwards through the soft tissues enclosed by the horny box until it reaches the coronet where it will "break out" and very likely form a "quittor" or fistula. On giving the pus "vent" through a channel pared in the horn, the part may be dressed with a wound lotion, and the hole lightly plugged with carbolized tow. When the pain is great, indicating suppuration, poultices may be applied for a day or two, or until obvious relief is given.

Foot Wounds.

Wounds of the sole and frog, other than pricks in shoeing, are usually caused by "gathered nails," sharp stones, broken glass or slates, wood

splinters, and iron pegs. Sometimes the wound may penetrate to the bone or into the coffin joint, in either of which cases the results may be very serious, because of the hindrance to exit of pus and foreign matters caused by the closure of the wound in the elastic horn. The principles of treatment to be followed, after removing any foreign body, and cutting an efficient exit opening in the horn, are the same as those indicated for pricks.

Quittor.

Quittor or fistula of the coronet is one of the most grave affections of the foot. In the early stages it partakes of the nature of an abscess situated on the coronet, but the contained pus is prevented from being evacuated completely on account of the hard unyielding horn which forms part of the wall of the abscess. Fluids cannot get discharged upwards; they remain imprisoned and act as irritants producing extension of the inflammation; so that, later on, the abscess, at first soft and fluctuating, becomes hard and much increased in size; openings, from which a little pus exudes, may form at different parts, and these are connected with pus canals running through the mass of tissue and deep down into the soft structures of the foot. The lateral cartilages may become involved in the inflammatory process and a hard swelling of considerable size becomes established on the coronet.

Causes.—As previously stated, quittors often result from neglected pricks in shoeing. They may also result from any wound in the foot from which pus cannot escape through the horn. As a direct cause, injuries to the coronet, such as may be inflicted by "tread," over-reaching or external violence of any kind, may be mentioned.

Fig. 111. Hoof affected with mild "quittor," showing fistulous openings at coronet, from which discharge is issuing.

Treatment.—Nothing short of bold surgery can insure success in treatment. Sometimes blistering the surface of the quittor, and introducing caustics such as arsenic and corrosive sublimate into the sinuses or canals, may effect a cure; but, as a rule, time is only lost by the adoption of such methods. It is, in most cases of well established quittor, the safest and quickest plan to excise the whole mass of diseased

tissue, and so form an open wound with healthy tissue surfaces, which may be treated in the ordinary way. It may be necessary to make an opening through the horn, either of the sole or wall, to meet the wound made by the excision superiorly, so that efficient drainage may be insured. Care must be taken in performing the operation that the coronary band is not cut away; as if this is done, there will be no subsequent formation of wall horn.

FOOTROT IN SHEEP.

Nature of the Disease.

After nearly a century of discussion, experimentation, and investigation engaged in by a host of world-renowned scientific and practical men, the conclusion has now been arrived at that there are three forms of footrot, viz.:—(1) *Simple footrot,* the ordinary widespread non-contagious form; (2) *contagious foot eczema,* or eczema epizootica, the "mal de pied" of the French; and (3) *inflammation of the interdigital duct.* Such a conclusion is satisfactory, and may be taken as settling the question of the contagiousness or non-contagiousness of footrot, about which so much controversy has centred. It seemed inexplicable that such keen observers as Youatt and Fleming, on the one hand, should pin their faith to its contagiousness, and that equally shrewd and experienced investigators like Dick and Williams should be convinced of its non-contagiousness. The former were swayed largely by their knowledge of the evidence of the contagiousness of a similar disease in France, where it is now known that contagious eczema of the feet of sheep, so closely identical in its symptoms and effects with simple footrot, is very rampant. The issue was clouded somewhat by the fact that sheep suffer sometimes from the "foot and mouth disease" of cattle, and doubtless at times this extremely contagious disease was mistaken for footrot. The first correct note, as foreshadowing a reconciliation of the diverse views that were held, was struck by Spooner, who considered the opinion that the disease was always, or even generally, contagious to be undoubtedly erroneous, but who stated his conviction that some outbreaks that he had experience of could not be explained otherwise than by contagion. Later on, Brown, who followed by researches which established the fact of the contagious nature of one form of disease, stated that this virulent form of footrot, recognised generally on the continents of Europe and America, was not often observed in England. Hogg, the Ettrick shepherd, when he recorded that he had known simple driving of a flock over a particular farm cause footrot in the flock, must have encountered the contagious eczema and mistaken it for simple footrot.

Similarly, it is likely that those outbreaks of so-called footrot which have been recorded at different times in Australia—particularly the Queensland outbreaks in the early nineties—and of which there is abundant proof of contagiousness, were in reality a visitation of the contagious foot eczema, which is closely allied to the contagious "foot and mouth disease" of cattle, but which possesses anatomical and other features whereby it may be comparatively easily distinguished from the more common and ordinary kind of footrot that is the bane of some localities in all seasons, and of additional localities in some seasons. It will be seen later that it is only in the first stages that the two diseases can be accurately distinguished, and that when established the lesions produced are practically alike.

Colour has been lent to the arguments of those theorists who hold that all footrot is contagious by the circumstance that the disease occurs epizootically; that is, it affects a large number of sheep simultaneously or successively, but such occurrence is in many instances satisfactorily accounted for by the fact that the whole flock is placed under similar operating causes. The disease being contracted by sound sheep on being introduced amongst affected sheep proves nothing more than that what will act as a cause in one sheep will also act as a cause in others that may be exposed to it. Finally, in these days of germs and germ-seekers the absence of any positive evidence of bacterial causation is significant, for it is now necessary, when claiming a specific or contagious character for a disease, to affirm its bacterial nature by incontrovertible proof, and as regards the ordinary footrot this has not been done.

Simple Footrot.

Simple footrot can only, then, be considered contagious in the false sense that a septic wound or running sore may be contagious; that is, the caustic discharges and horn scales from affected sheep, by being trampled and paddled upon by other sheep, and so brought in contact with the soft, tender horn between the toes (perhaps already inflamed and sore), may cause such irritation as will serve to set up inflammation of a character which, fostered by the natural dirtiness of the situation, develops into footrot.

While not at all likely to terminate fatally, footrot is, nevertheless, a source of heavy monetary losses to pastoralists, in that the pain and irritative fever which accompany moderatively severe cases prevent that rapid growth and thriving condition which are essential to profitable sheep culture. The fleece suffers from the unthriftiness, and fattening is tardy for the same reason, and also because there is disinclination to "forage" for the best "picking."

Nature and Causes.—Footrot is essentially an inflammation of the tissues of the foot subjacent to the horn, varying in intensity from a mere erosion or sore to a sloughing ulceration, and caused by an injury of some kind. It is often primarily caused by a softening of the horn of the feet, particularly that thin and naturally tender horn on the inner aspect of the claws, whereby it becomes greatly more prone to injury of any kind. It is hence particularly prevalent in low-lying, marshy, or undrained situations, where the feet are likely to be kept continuously soft and spongy. When in this state the slightest injury from rough grass, stubble, stones, or uneven ground, soon becomes a sore, and through inoculation with dirt and decomposing organic débris, ulceration and under-running of the horn with matter quickly follow. Footrot is also met with in sheep grazing on high, gravelly land, or which have travelled long distances over hard ground, and in these cases the disease is simply an extension of footsoreness. Again, when found on loose, sandy soils its occurrence is due to the fact that on these soils there is little wear of the horn; the claws become long and overgrown, and subsequently mechanically inflamed. As a general rule, the disease prevails most on moist land in wet weather, and on dry land in dry weather.

Symptoms.—Lameness or apparent difficulty in walking and frequent inclination to rest are first noticed; in a few days the hobbling, painful gait is accentuated, and the sheep begins to fall away in condition and assume a lank appearance. On examination the affected feet will be found

to be hot and painful when pressed, and a moist, foul-smelling discharge will be noticed between the claws, the thin horn on the inner sides being swollen. Later on the soft tissues above and around the foot will become swollen and inflamed, and a strong pulse may be felt in the region; the discharge between the claws increases and becomes purulent (mattery); the horn becomes crumbly and disintegrated, being eaten away, as it were, by a kind of dry rot process, and the sore may spread until the whole of the side and under-surface of the claws becomes involved in the ulceration. The sensitive blood-vascular laminæ which secrete the horn are by this time exposed, and may produce fungus-like growths (proud flesh, really) which bleed on the slightest touch, so forming along with the offensive discharge a soft scab, which rubs off easily. By this time the sheep has no inclination to walk; it "scraffles" along on its knees or belly according

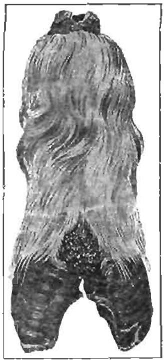


Fig. 112. Footroot in early stage, showing disease commencing between the claws. (After Armatage.)

Fig. 113. Advanced footrot, showing growth of spongy horn. (After Armatage.)

as the fore or hind feet are affected, and, partly from want of food and partly from febrile pain, soon becomes a lean, pitiable object. In extreme cases the claws may be shed, but as a rule, with reasonable care and treatment, the more serious of the conditions above described are not experienced.

Treatment.—The object of treatment is primarily to render the parts clean and sweet, and keep them so by destroying the septic germs which are responsible for the spreading ulceration and irritating discharges, then to allay irritation, and finally to promote a healthy horn growth. To effect this it will be necessary that, whatever application is used, it should be given a chance to get at the innermost and uttermost ramifications of the ulceration where the festering germs are, and consequently the rough-and-ready method adopted on some stations of depending solely on foot-baths is often ineffective. It may do in the early stages when the disease has not under-run the horn, but if such has occurred all loose and under-run

horn requires to be pared away, otherwise the medicament cannot reach the seat of the operations of the germs which it is intended to destroy.

Various agents have been used with success in treating footrot—butyr of antimony, nitric acid, creosote, carbolic acid, arsenic, and many others. These are all antiseptic and caustic in their action, and perhaps the most consistently successful of them is butyr of antimony, which, when mixed with an equal proportion of tincture of myrrh, forms a first-rate footrot lotion to be kept in stock. This or other fluid dressing should be applied to the affected parts with a feather or brush, so that the adjacent skin is not needlessly burnt.

When footrot has become established in a flock the treatment should be prompt, methodical, and thorough if heavy monetary loss is to be avoided. The flock should be yarded, and all sheep showing the slightest halting or lameness should be caught and turned, their feet examined, and the necessary paring, to expose the sores and shape the claws, cleanly and thoroughly done. To be on the safe side the whole flock should be gone through in this way once at least, if practicable. The sheep should then be turned directly into a race foot-bath, about 10 or 15 feet long, and allowed to pass loiteringly through on to dry ground. An arsenic solution is generally used for the bath, and it is effective if the paring has been sufficiently thorough. It is made by boiling together 2 lbs. of white arsenic and 3 lbs. of carbonate of potash (or 4 lbs. of washing soda) in 14 gallons of water until all the arsenic is dissolved. The solution is placed in the bath to a depth of 2 inches, and replenished as required. The procedure may require to be repeated two or three times, at intervals of a fortnight. Recently I had occasion to suggest a line of treatment for a footrotted flock, and a solution of formalin as a foot-bath, followed by paddling on quicklime, was adopted with great success. Schering's formalin was used in the proportion of 1 to 50 of water (5 lbs. of formalin, costing 8s., to 25 gallons of cold water), and the sheep were passed from the foot-bath along a wooden platform on to the hard floor of a woolshed, which had been covered to a depth of about an inch with powdered quicklime. On this the sheep were allowed to paddle for an hour or two, and when turned out on to a dry, bare paddock they carried with them caked on the diseased feet, a packing of antiseptic and caustic quicklime, which so promoted healing that it was only necessary to repeat the procedure once again at the end of ten days.

Special Treatment will require to be adopted in the case of individual sheep badly affected. After paring and cleansing, the raw surfaces should be cauterized with burnt alum nitrate of silver (lunar caustic), or bluestone, or chromic acid, to reduce the soft, fungoid growths and to stimulate the formation of healthy horn. They should then be given a dressing with Stockholm tar, which, in addition to being antiseptic, forms an adhesive covering to protect the sores; in many cases it is advisable to protect the dressed feet from dirt and air by bandaging, or applying a specially made "stool," to be tied on with tapes, and which will also help to keep the dressings in position. As improvement takes place the above strong caustics should be discontinued, and the milder stock lotion previously mentioned applied.

It must be borne in mind that treating the disease without removing the conditions which promote it will always be unsatisfactory. A change of pasturage, whether from wet, boggy land, or from soft or gravelly country, according as each may have been in use, is always advisable.

Contagious Foot Eczema.

The differential diagnosis of this affection from simple footrot can only be made in the early stages, and depends upon observation of the starting place of the disease. In this disease the first tenderness, heat, and swelling occurs round the coronet at the junction of the horn and skin. This is followed by the formation of a ring of soft, spongy, crumbly horn near the coronet, and the disease then spreads to between the claws and other parts of the foot. From this out, mainly on account of the parts becoming infected with dirt or septic matter from the ground, the progress of the disease and the appearances and symptoms resemble ordinary footrot, except that there is usually more swelling of the tissues above the claws, and there is a tendency for the claws to slough off. The local treatment for the affection should be the same as that advised for simple footrot, but the stronger caustics are not usually required.

Inflammation of the Inter-digital Duct.

Situated in the skin between and just above the claws in front is the opening of a duct, called the inter-digital or inter-ungulate duct, which leads from a small gland situated between the pastern bones. The gland secretes a semi-solid oily substance of a greenish opalescent hue, which is conveyed by the duct and is discharged on to the delicate skin and horn

Fig. 114. Foot of sheep. The opening of the inter-digital duct is marked at (*a*). (After Armatage.)

between the claws, which are thereby lubricated and protected from wet and dirt and friction. On soft, clayey land, and on gravelly land, the duct opening is liable to become blocked with mud or grit, and two untoward results may follow—the tender skin and horn, being unprotected, may become dry, irritated, and inflamed, and the duct itself may become inflamed by the irritation of the foreign body blocking it. In either or in both of these events the inflammation soon involves the soft structures beneath the horn, and, again from inoculation with septic matter and dirt, the sequence of all the progressive stages of footrot may be commenced. When blocking or inflammation of the duct is observed in the early stages, the cutting away of the blocked portion or the slitting of the duct and removal of the foreign body will usually result in recovery. Otherwise the treatment to be followed is that previously outlined.

FOUL-IN-THE-FOOT OF CATTLE.

This is a disease of the feet of large cattle resembling very much footrot in sheep. It is induced largely by the softening of the horn of the claws, resulting from standing continuously in manure and filth, such as frequently happens in ill-kept byres, where cattle are kept housed, as in Northern countries, during the winter months. In Australia, where cattle are for the most part kept continuously at pasture, and only housed at milking time, the disease is rare.

The *treatment* requires to be on lines identical with those recommended for footrot in sheep.

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Imported Varieties.

George Seymour, Potato Expert.

In submitting the following report on the varieties of potatoes imported by the Department of Agriculture, from Messrs. William Davie and Co., potato growers and seedsmen, Haddington, Scotland, it should be mentioned that the whole parcel was composed of white-skinned varieties only one having any distinguishing marks, viz.—King Edward VII., which is tinged with pink at the eyes and crown ends. This parcel of seed consisted of 25 varieties, and arrived in Melbourne early in February, 1905. The potatoes were planted as an autumn crop by the following growers in the Metropolitan area, viz.:—Messrs. H. Brown (Mordialloc), Clement (Ormond), and Kitchen (Glen Huntly); and in the country districts by Messrs. W. Crowe (Koroit), W. Goldie (Port Fairy), and John Newton (Kingston). The produce of these plots was planted the following spring at Mrs. Bland's (Yarram), and Mr. Hill's (Iona). Both plots met with adverse weather conditions, the yield in each place being very light. (See *Journal* for August, 1906.) The seed obtained from the Yarram and Iona plots was planted in November, 1906, on my farm at Romsey. Yields are included in the table on page 654.

The produce of the 1907 crop has been distributed in 28-lb. parcels, containing four varieties (7 lbs. of each). In this way the different varieties have been widely distributed throughout the State, and it is hoped that every grower will furnish the Department with particulars of the results obtained by him, and state which varieties are best suited to his particular district. The whole of the varieties have been planted at the Agricultural High Schools at Sale and Warrnambool, and further opportunities of ascertaining their respective merits will thereby be afforded.

None of the varieties can be considered superior in quality to many of the old sorts grown in Victoria in the past. This may be accounted for in a measure by the fact that the potato most in demand in the old country is the one that resists disease; this means robustness of habit which is often accompanied by a lower quality of tuber. The varieties most likely to find a place among those already grown in this State are Warrior, The Factor, Table Talk, Scottish Triumph, Main Crop, British Queen, Sir John Llewellyn, Royal Kidney, and Duke of Rothesay.

Many of the varieties spoken of highly in Great Britain do not seem suited to this climate. Some of the seed was in a wasted condition when

received, and did not crop well the first season. In spite of every care, three have dropped entirely out of the list, viz.:—Diamond, World's Fair, and Foundling. The first year's produce was as follows:—Diamond, 2 lbs., World's Fair, 1 lb., Foundling, 4 lbs.; in 1905, these were planted i Mr. Hill's plot at Iona, with no better results, and last season I planted them in my garden, with the result that the two first mentioned failed completely, whilst the Foundling produced a few small tubers.

After arrival, five or six tubers of each variety were placed by Mr. Knight in a cool chamber, and kept at a temperature of 40 degrees: some of these have shown considerable vitality, having been upwards of nine months in the chamber when handed over to me. They were planted on 24th November, 1905, and nine out of twenty-five varieties grew. The following results show that Early Puritan, Duke of Rothesay, and General Kitchener were the only early ones to survive.

Name.	No of sets planted.	No of sets that grew.	Remarks.
Early Puritan	3	1	Few very small tubers; plant good
Duke of Rothesay	5	1	Six nice even-sized tubers
Scottish Triumph	6	1	Plants strong; very good tubers
Table Talk	2	2	Very good; strong plant
General Kitchener	4	1	Medium
Northern Star	6	1	Poor stringy lot; small tubers
Empress Queen	6	1	Very poor; weak plant
Warrior	6	4	Very fine tubers; strong plant
Up-to-date	4	1	Medium; good plant

In February, 1906, at the request of Mr. H. Brown (Mordialloc), I inspected a plot composed of nineteen varieties, from which one average plant of each was lifted. The produce was graded to market and small, but the weights given below represent the total produce of each variety per acre. Tests for cutting and cooking qualities were made, and these results are also published. I have made several tests since, and find they have been confirmed in the case of almost every variety; Up-to-date and British Queen were the exceptions, the former having improved in appearance when cut. It should be stated that there are two types of Up-to-date, one oval, which produces a large proportion of kidney-shaped tubers, the other round. The former is the best quality, and growers would do well to select it when buying seed. In the case of British Queen, it has shown

YIELDS.

Variety	Yield per Acre. tons	cwts.	qrs.	Variety.	Yield per Acre. tons	cwts.	qrs.
King Edward VII. ...	4	8	0	Duke of Rothesay ...	6	12	0
Evergood	4	8	0	Sir John Llewellyn .	8	16	
The Factor	8	16	0	Duchess of Buccleuch ...	8	16	
Empress Queen	3	6	0	General Kitchener ...	8	16	
Up-to-date	15	8	0	Scottish Triumph ...	9	18	
British Queen	4	8	0	Dunion	8	16	
Twentieth Century ...	5	10	0	Northern Star	4	8	
Royal Kidney ...	6	12	0	Warrior	13	4	
Early Puritan	8	16	0				

a decided improvement in every test, and when grown in chocolate soils it cuts very white, cooks mealy with good flavour, and should have 95 points under each head, making a total of 190 instead of 165 points.

CUTTING TESTS.

Name of Variety.	Cutting.	Cooking.	Total.	Remarks.
King Edward VII. ...	80	80	160	Wet and soapy
Evergood	75	80	155	Mealy; flavour medium
The Factor	86	97	183	White, mealy, good flavour
Empress Queen ...	75	85	160	Rather waxy
Up-to-Date	80	90	170	Dry, mealy, good flavour
British Queen	80	85	165	Mealy, flavour good
20th Century	75	97	172	Flavour good
Royal Kidney... ..	80	89	169	Mealy, medium flavour
Goodfellow	80	85	165	Medium
Duke of York... ...	60	75	135	Yellow, peculiar sweet flavour
Early Puritan... ...	90	98	193	White, mealy, flavour good
Duke of Rothesay ...	80	90	170	Mealy, flavour good
Sir John Llewellyn ...	100	100	200	White, flavour good
Duchess of Buccleuch ..	80	90	170	Mealy, flavour good
General Kitchener ..	79	80	159	Poor quality
Scottish Triumph ..	75	89	164	Mealy flavour, good
Dunion	80	90	170	Mealy flavour, good
Northern Star...	50	—	—	Poor, wet cooked
Warrior ..	100	90	190	White, mealy, flavour good

WEIGHT AT ONE STALK. GROUND EQUAL, AND SAME TREATMENT.

Name.	Yield.		Weight of Stalks.		No. of Large.	No. of Small.	Remarks.
	lbs.	ozs.	lbs.	ozs.			
King Edward VII. ...	4	4	1	0	2	7	Irregular and stringy.
Evergood	4	4	1	0			
The Factor	8	8	2	0	8	2	Very good: nearly all large.
Empress Queen ...	3	3	0	12	...	...	Very poor.
Up-to-date	15	4	3	8	8	2	Very good.
British Queen... ...	4	4	1	0	6	5	
20th Century	5	5	1	4	...	...	Very good.
Royal Kidney ...	6	6	1	8	6	4	Fair.
Goodfellow	...		...		...	...	Poor; small.
Duke of York ...	.		...		...	...	Very irregular; small.
Early Puritan... ...	8	8	2	0	8	3	Fine; even.
Duke of Rothesay ...	6	6	1	8	7	3	Fair.
Sir John Llewellyn ...	8	8	2	0	6	4	Very even; plants ripening early.
Duchess of Buccleuch ...	8	8	2	0	4	8	Very stringy and poor.
General Kitchener ...	8	8	2	0	8	4	Good; late.
Scottish Triumph ...	9	9	2	4	8	3	Good, fine, even; lot of tubers.
Dunion	8	8	2	0	5	2	Good.
Northern Star ...	4	4	1	0	...	...	Very poor and stringy.
Warrior	13	2	3	0	9	...	Fine lot; no small tubers; best of all.

10,000 plants per acre.

The following is the report of Mr. W. Goldie, of "Clarke Brae," Port Fairy :—

Variety.		Yield per Acre.	Remarks.
		Tons cwt. qrs.	
King Edward VII.	...	4 3 0	Dark green tops
Evergood ...	...	3 6 0	Sprawling tops
The Factor ...	...	3 5 1	Sprawling, light green tops
Empress Queen	..	5 6 0	Very heavy tops
Up-to-date ...	..	4 15 0	Very heavy tops
British Queen ...	...	3 15 0	Sprawling, dark green tops
Twentieth Century	...	4 15 0	Very heavy growth
Royal Kidney...	...	5 5 0	Sprawling, light green tops
Goodfellow .	..	2 1 1	Small growth
Duke of York ...	...	1 14 1	Rather spindly, light green ops
Early Puritan...	..	0 15 1	Light growth
*Duke of Rothesay	...	1 7 0	Light green tops
*Sir John Llewellyn	...	4 7 3	Bunchy tops
Duchess of Buccleuch	...	4 0 0	Heavy growth
General Kitchener	...	2 14 0	Heavy growth
Scottish Triumph	..	4 14 0	Heavy growth
Dunion ..	...	3 10 0	Upright, dark green
Northern Star	...	4 2 0	Very heavy and bunchy
Warrior ...	...	5 7 3	Very long and sprawling

* In these two varieties large sets were planted in one drill and small in another. In both cases the large sets gave much the best return.

All were planted on 2nd March, 1905, and the remarks are based on the appearance of the plants on 20th April. They were dug up on the 12th June.

Mr. Crowe (Koroit), in his report, furnishes the following information relative to the varieties grown on his land :—

Variety.		Yield per Acre.	Remarks.
		Tons cwt. qrs.	
World's Fair	...	7 4 1	Very large vigorous stalks, a little damaged by wind
Warrior ...	...	6 3 3	Good growth, but much damaged
Twentieth Century	...	5 16 3	Very good stalks, dark in colour, not damaged
Northern Star	...	3 8 3	Small growth, but not damaged
Duke of York	...	3 8 3	All right, only slightly damaged
The Factor	...	3 1 3	Poor growth, and much damaged
General French	...	3 1 3	Good, but damaged
Duke of Rothesay	...	3 1 3	Small stalk, slightly damaged
Royal Kidney	...	2 15 0	Small stalk, not damaged
General Kitchener	...	2 15 0	Poor growth, very much damaged
British Queen	...	2 8 0	Poor growth, much damaged

All were planted 1st April, 1905, and dug on 23rd July following. The observations respecting the plants were taken from their appearance on the 21st May. The buds on the several varieties were all shooting when received and came over ground very soon after planting. Each potato was planted whole and being out of season there were no large tubers under them when dug. All the produce was weighed, and when it is recognised that one of the best varieties came out the worst the above results are of little value except to compare with other results.

Mr. John Newton's report is as follows:—

The seed was planted the second week in November, 1905. British Queen and Twentieth Century were the first plants over ground, and Dunion and King Edward VII. the last; all the others came up at the same time.

February 27.—175 points rain. Early Puritan and Royal Kidney ripe; Dunion, Empress Queen, and Up-to-date still blooming, and Warrior and King Edward finished growing, not ripe.

April 25.—Frost. King Edward, Northern Star, Early Puritan, Royal Kidney, Evergood, Goodfellow, British Queen, Duke of Rothesay, General Kitchener, Sir John Llewellyn, Duke of York, all dead ripe. Warrior, Dunion, Scottish Triumph, Up-to-date, Twentieth Century, Factor, Duchess of Buccleuch, Empress Queen, still green and growing.

June 1st. All dug. The following all worth trying again:—Duchess of Buccleuch, Factor, Twentieth Century, Scottish Triumph, Warrior, and Up-to-date, Northern Star, wild stringy lot; Empress Queen and General French not much good; King Edward tubers very badly shaped and stringy. All others small sample and not of much account.

—	Colour of Bloom.	Yield per Acre.			Character of Plant.
		Tons	cwt.	qrs.	
King Edward ...	Mauve	6	12	0	Bushy plant
Evergood	White	2	14	0	Bushy plant
Factor	Mauve	4	0	0	Strong, vigorous plant
Empress Queen ...	Mauve	6	14	0	
Up-to-Date ...	Mauve	3	18	0	Very strong plant
British Queen ..	White	2	18	0	Small bushy plant
Twentieth Century ...	White	4	18	0	Very strong plant
Royal Kidney ...	White	4	8	0	Medium plant
Goodfellow ...	White	4	2	0	Medium plant
Duke of York ...	White	1	16	0	Delicate plant
Early Puritan ...	White	2	4	0	Delicate plant
Duke of Rothesay ...	White	3	0	0	Medium, light-green plant
Sir J. Llewellyn ...	White	1	2	0	Delicate plant
Duchess of Buccleuch	Mauve	4	8	0	Strong and vigorous, like a late variety
General Kitchener ...	...	*3*	*14*	*0*	*Medium plant*
Scottish Triumph ...	Mauve	6	8	0	Very strong plant, like a late variety
Dunion	Mauve	5	14	0	Strong, vigorous plant
Northern Star ...	Mauve	4	0	0	Very bushy plant
Warrior	Mauve	4	12	0	Strong, healthy plant

There are far too many varieties of potatoes, especially white-skinned sorts; a great number are of little value, and could be well classed out. It is to be hoped that at no distant date an effort will be made to have a thorough investigation of the present bewildering list of varieties, with a view to weeding out all worthless sorts. There can be no doubt but that ten or twelve of the present standard varieties would be sufficient for local requirements and export. In order to carry out this work satisfactorily the tests should be continued for several years in order to arrive at the value of each kind. In this way they could be grouped according to cropping and cooking qualities, and all light yielding and inferior cooking sorts should be rejected.

SUMMARY OF RESULTS.

Name of Variety.	E.—Early. M.C.—Main Crop. L.—Late.	By Whom Grown. Mr. W. Goldie, Port Fairy, 1906.			Mr. W. Crowe, Koroit, 1906.			Mr. J. Newton, Kingston, 1906.			Mr. Paternoster, Cockatoo, 1906.			Mr. Duff, Carrum, 1906.			Mr. G. Seymour, Romsey, 1907.			Averages of Yarram and Iona Plots, 1906.		
		Tons.	cwts.	qrs.	Tons.	cwts.	qrs.	Tons.	cwts.	qrs.	Tons.	cwts.	qrs.	Tons.	cwts.	qrs.	Tons.	cwts.	qrs.	Tons.	cwts.	qrs.
King Edward VII. ..	E.	4	3	0		..		6	12	0	4	3	1		..			..		1	14	0
Evergood	E.	3	6	0		..		2	14	0		..			..		1	10	0	0	18	0
Factor	M.C	3	5	1	3	1	3	4	0	0		..			..		5	0	0	1	14	0
Empress Queen ..	L.	5	6	0		..		6	11	0	3	14	1		..		2	0	0	1	10	0
Up-to-date	M.C.	4	15	0		..		3	18	0	8	18	1		..		7	1	0	1	10	0
British Queen ..	E.	3	15	0	2	8	0	2	18	0	3	15	0	4	7	0	3	14	0	2	14	0
Twentieth Century ..	M.C.	4	15	0	5	18	3	4	15	0	7	16	0	4	17	0	4	10	0	2	13	0
Royal Kidney ..	E.	5	5	0	2	15	0	4	8	0		..			..		4	6	0	1	14	0
Goodfellow	M.C.	2	1	1				4	2	0	3	9	0	3	8	0	1	16	0	2	3	0
Duke of York .	E.	1	14	1	3	8	3	1	16	0	2	4	0	2	1	0	2	8	0	1	10	0
Early Puritan ..	E.	0	15	1		..		2	4	0	2	13	0		..		1	12	0	1	6	0
Duke of Rothesay ..	E.	1	7	0	3	13	0	3	0	0	2	18	0		..		1	4	0	2	1	0
Sir John Llewellyn .	E.	4	7	3		..		1	2	0	2	6	0		..		0	12	0	1	6	0
Duchess of Buccleuch	E.	4	0	0		..		4	8	0		..			..		6	18	0	1	11	0
General Kitchener ..	E.	2	14	0	2	15	0	3	14	0	5	18	0		..		2	14	0	1	10	0
Scottish Triumph ..	M.C.	4	14	0		..		6	8	0	8	9	0		..		5	8	0	1	10	0
Dunion	M.C.	3	10	0		..		5	14	0	4	12	0		..		2	14	0	1	10	0
Northern Star ..	L.	4	2	0	3	8	3	4	0	0	7	10	0	3	9	0	4	6	0	2	1	0
Warrior	L.	5	7	3	6	3	3	4	12	0	6	5	0				4	18	0	1	16	0
Table Talk	M.C.		..			..			..		7	5	2		..		4	14	0	1	19	0

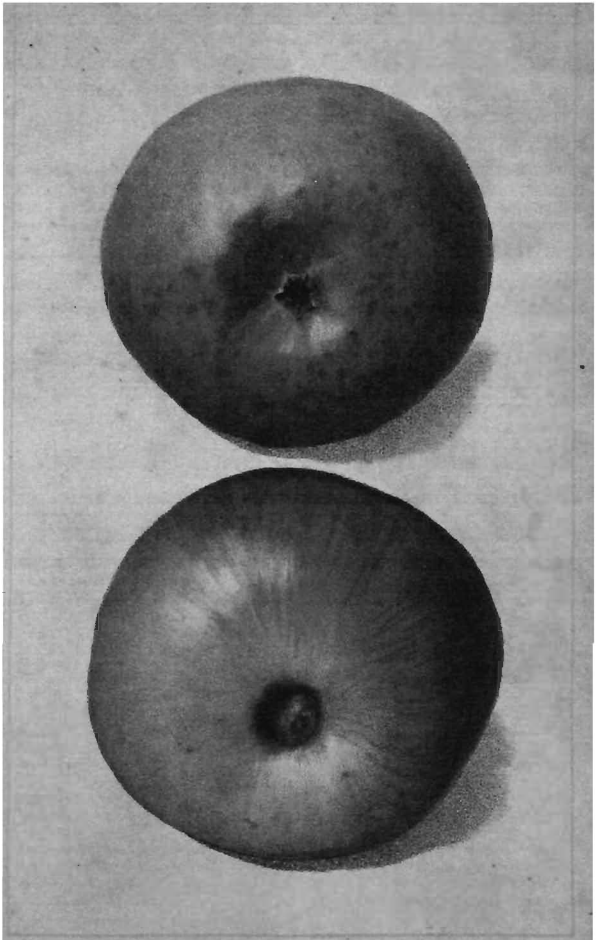
DESCRIPTION OF APPLE.

James Lang, Harcourt.

Scarlet Nonpareil.

Fruit below medium size, round and somewhat smaller at the apex, about 3 inches wide at the base, and 2½ inches high; regular and even in its outline. Eye open, set in a wide shallow basin; stalk about an inch long, inserted in a small round cavity lined with russet. Skin greenish yellow on the shaded side, and where fully exposed to the sun the fruit is a beautiful crimson all over. Flesh yellow, tender, and juicy, with a fine aromatic flavour; an excellent dessert apple, in season from March until September. The tree is a small grower, and as a rule does not attain a large size. Where the fruit grows to a fair size it is a good apple to export, but when trees crop heavily it is generally too small for that purpose.

This is the apple that is sent in large quantities from Tasmania under the name of Scarlet Pearmain.



SCARLET NONPAREIL.

Artificial Manures Acts.

SUPPLEMENTARY LIST OF UNIT VALUES OF MANURES IN THE MELBOURNE MARKET DURING THE 1907 SEASON.

Description of Manure.	Moisture.	Nitrogen.		Phosphoric Acid.		Estimated Total Value of Manure per ton.	Price asked for Manure per ton Delivered at Local Railway Station.	Where Obtainable.
	Percentage.	Percentage.	Estimated Value in One ton of the Manure.	Percentage.	Estimated Value in One ton of the Manure.			
Nitrogenous Manure, containing Phosphoric Acid also.			£ s. d.		£ s. d.	£ s. d.	£ s. d.	
Bone and Meat	1.63	2.94	1 10 2	23.39	3 10 2	5 0 4	5 15 0	Thos. Borthwick and Sons, Portland
Bone, Meat, and Blood	6.48	6.98	3 15 10	8.86	1 6 7	5 2 5	6 0 0	" " " "

Description of Manure.	Moisture.	Nitrogen.		Phosphoric Acid.		Mechanical Condition.						Estimated Total Value of Manure per ton.	Price asked for Manure per ton. Delivered at Local Railway Station.	Where Obtainable.
								Nitrogen.		Phosphoric Acid.				
	Percentage.	Percentage.	Estimated Value in One ton of the Manure.	Percentage.	Estimated Value in One ton of the Manure.	Percentage of Fine Bone.	Percentage of Coarse Bone.	Percentage in Fine Bone.	Percentage in Coarse Bone.	Percentage in Fine Bone.	Percentage in Coarse Bone.			
Containing Phosphoric Acid and Nitrogen. Phosphoric Acid difficultly soluble.			£ s. d.		£ s. d.							£ s. d.	£ s. d.	
Bonedust	1.99	2.43	1 5 7	27.16	5 0 6	70.00	30.00	1.70	0.73	19.01	8.15	6 6 1	6 0 0	Thos. Borthwick and Sons, Portland
Bonedust	10.91	3.81	1 10 8	24.32	3 15 0	8.50	91.50	0.32	3.49	2.07	22.25	5 11 8	5 15 0	William Moore, Panmure

W. PERCY WILKINSON,
Government Analyst and Acting Chemist for Agriculture.

Government Laboratory,
Melbourne, 1st October, 1907.

Artificial Manures Acts.

LIST SHOWING RESULTS OF ANALYSES OF SAMPLES OF ARTIFICIAL MANURES COLLECTED IN THE STATE OF VICTORIA UNDER THE PROVISIONS OF THE ARTIFICIAL MANURES ACTS.

Label No.	Official No.	Description of Manure.	Manufacturer or Importer.	Moisture.	Phosphoric Acid. Water Soluble. Found.	Water Soluble. Guaranteed.	Citrate Soluble. Found.	Citrate Soluble. Guaranteed.	Insoluble. Found.	Insoluble. Guaranteed.	Total. Found.	Total. Guaranteed.	Average Net Weight found.	Net Weight guaranteed.	Estimated Value per Ton.
				%	%	%	%	%	%	%	%	%	lbs.	lbs.	£ s. d.
252	19451	Superphosphate, Standard Flag Brand	Renard Fertilizer Coy., Melb.	9.46	16.72	17.00	1.52	2.5	0.72	0.5	18.94	20.00	220	224	4 2 0
89	19101	,, ,, ,,	,, ,, ,, ...	8.91	15.60	17.00	2.64	2.5	1.60	0.5	19.84	20.00	223	224	4 2 4
267	19524	Ordinary Superphosphate, Federal	Aust. Explosives and Chemical Coy., Melb. ..	8.68	18.07	18.00	0.72	1.5	1.92	1.5	20.71	21.00	224	224	4 6 1
242	19399	,, ,, ,,	,, ,, ,, ,, ,, ..	7.43	19.41	18.00	1.22	1.5	0.84	1.5	21.47	21.00	In stock	In stock	4 13 0
255	19452	,, ,, ,,	,, ,, ,, ,, ,, ..	8.24	19.68	18.00	0.84	1.5	1.04	1.5	21.56	21.00	..	224	4 12 11
296	19724	15 per cent. Superphosphate, Federal	,, ,, ,, ,, ,, ..	8.04	11.66	13.20	4.09	0.2	0.48	1.1	16.23	14.50	..	221	3 9 4
278	19655	Superphosphate, Wischer's	Wischer and Co., Melb.	9.54	17.72	19.00	2.00	1.0	3.37	1.0	23.09	21.00	..	224	4 11 1
77	19032	,, ,, ..	,, ,, ...	8.00	18.02	19.00	0.93	1.0	0.79	1.0	19.74	21.00	..	224	4 5 7
237	19391	,, ,, ..	,, ,, ,, ...	10.28	19.44	19.00	1.37	1.0	1.82	1.0	22.63	21.00	..	224	4 14 9
282	19400	,, ,, ..	,, ,, ,, ...	5.82	18.06	19.00	2.07	1.0	3.69	1.0	23.82	21.00	..	224	4 13 3
263	19526	Superphosphate, Florida ..	Cuming, Smith, and Co., Melb.	9.93	19.36	19.00	0.89	1.0	2.16	1.5	22.41	21.50	..	224	4 12 9
269	19717	,, ,, ..	,, ,, ,, .. .	12.20	17.86	19.00	0.90	1.0	2.66	1.5	21.42	21.50	..	224	4 6 7
293	19667	,, ,, ..	,, ,, ,, ...	10.68	17.88	19.00	0.19	1.0	3.55	1.5	21.62	21.50	..	224	4 4 9
240	19403	,, ,, ..	,, ,, ,, . .	12.17	20.24	19.00	0.70	1.0	0.69	1.5	21.63	21.50	..	224	4 14 7
246	19437	,, ,, ..	,, ,, ,, . ..	12.19	18.21	19.00	1.12	1.0	2.90	1.5	22.23	21.50	232	224	4 9 4
283	19721	Superphosphate, No. 1 ..	Mt. Lyell M. and R. Coy., Melb. .. .	10.76	19.06	19.00	0.66	1.0	1.02	1.0	20.74	21.00	..	224	4 9 5
239	19402	,, ,, ..	,, ,, ,, ,, .. .	10.64	19.27	19.00	1.36	1.0	1.97	1.0	22.60	21.00	..	224	4 14 2
249	19438	,, ,, ..	,, ,, ,, ,, . .	10.21	20.07	19.00	1.45	1.0	1.42	1.0	22.94	21.00	..	224	4 17 6
277	19654	Superphosphate, Soluble Jap	A. H. Hasell, Melb.	12.88	17.55	18.50	1.44	1.5	0.05	..	19.04	20.00	..	224	4 4 10
253	19447	Superphosphate, Hasell's ..	,, ,, ...	11.08	17.20	18.50	1.64	1.5	0.19	..	19.03	20.00	..	224	4 4 1
231	19389	Superphosphate, No. 1 ..	Colonial Manures Coy., Melb.	13.49	16.29	17.50	1.89	1.0	0.12	..	18.30	18.50	219	224	4 1 0
235	19390	Superphosphate, No. 2 ..	,, ,, ,, . .	12.43	12.66	14.00	1.97	1.0	0.06	..	14.69	15.00	222	224	3 4 11
251	19445	Superphosphate, damaged	P. Rohs, Bendigo	5.42	13.91	..	0.23	..	trace	..	14.14	..	In stock	In stock	3 3 6
273	19652	Superphosphate, Ovens Improved	Strachan, Murray, and Shannon, Geelong ..	10.78	17.24	16.51	0.95	1.85	0.11	..	18.30	18.36	..	224	4 1 6

LIST SHOWING RESULTS OF ANALYSES OF SAMPLES OF ARTIFICIAL MANURES, ETC.—*continued.*

Label No.	Official No.	Description of Manure.	Manufacturer or Importer.	Moisture.	Nitrogen. Found.	Nitrogen. Guaranteed.	Phosphoric Acid. Found.	Phosphoric Acid. Guaranteed.	Average Net Weight found.	Net Weight guaranteed.	Estimated Value per Ton.
				%	%		%				£ s. d.
266	19528	Blood	Geo. Gardiner, Geelong ..	5.63	1.64	..	12.47	..	..	..	2 15 5

Label No.	Official No.	Description of Manure.	Manufacturer or Importer.	Moisture.	Nitrogen. Found.	Nitrogen. Guaranteed.	Phosphoric Acid. Water Soluble. Found.	Water Soluble. Guaranteed.	Citrate Soluble. Found.	Citrate Soluble. Guaranteed.	Insoluble. Found.	Insoluble. Guaranteed.	Total. Found.	Total. Guaranteed.	Average Net Weight Found.	Net Weight Guaranteed.	Estimated Value per ton.
				%	%	%	%	%	%	%	%	%	%	%	lbs.	lbs.	£ s. d.
264	19527	Dissolved Bones ..	Cuming, Smith, and Co., Melb. ..	6.97	1.18	1.00	6.56	10.01	4.55	3.88	11.11	5.48	22.22	19.37	..	224	4 13 1
272	19653	" " ..	" " " " ..	10.12	1.27	1.00	8.83	10.01	4.10	3.88	8.70	5.48	21.63	19.37	..	224	4 15 3
238	19401	Nitro Superphosphate ..	Mt. Lyell M. and R. Coy., Melb. ..	12.65	1.75	1.60	15.71	16.00	1.23	1.00	0.67	0.75	17.61	17.75	..	224	4 15 6
271	19674	" " ..	" " " " ..	11.47	1.71	1.60	16.31	16.00	0.79	1.00	1.79	0.75	18.89	17.75	..	224	4 19 4
282	19720	" " ..	Cuming, Smith, and Co., Melb. ..	0.59	1.06	1.00	8.08	10.01	5.65	3.88	6.44	5.48	20.17	19.37	..	224	4 9 1
241	19398	" " ..	Aust. Explosive and Chemical Coy., Melb.	11.98	0.81	0.98	9.03	13.50	6.16	0.20	1.73	1.20	16.92	14.90	..	224	3 18 10
92	19270	Bone and Superphosphate	" " " "	4.40	Trace	1.00	18.80	12.00	1.00	0.50	2.49	7.00	22.29	19.50	..	224	4 16 1
250	19439	" "	Cuming, Smith, and Co., Melb. ..	8.96	1.22	1.50	8.11	7.50	6.90	5.00	6.21	8.50	21.22	21.00	..	224	4 15 3
295	19668	" "	" " " " ..	8.80	1.41	1.50	7.63	7.50	6.66	5.00	8.88	8.50	23.17	21.00	..	224	5 2 1
268	19710	" "	" " " " ..	7.92	1.33	1.50	7.68	7.50	8.24	5.00	9.04	8.50	24.96	21.00	..	224	5 8 3
270	19673	" "	Mt. Lyell M. and R. Coy., Melb. ..	10.53	1.47	1.30	12.48	13.50	4.96	3.75	4.45	4.50	21.89	21.75	..	224	5 4 5
258	19440	" "	Renard Fertilizer Coy., Melb. ..	7.24	1.06	0.90	8.97	12.75	7.57	4.25	2.04	2.31	19.58	19.31	229	224	4 7 7
*230	19274	" " ..	A. E. Kleiner, Wangaratta ..	15.68	0.78	1.75	..	..	7.62	5.58	1.28	3.84	8.90	9.42	..	112	2 3 5
228	19273	Thomas Phosphate ..	Cuming, Smith, and Co., Melb. ..	..	..	..	..	..	15.40	16.40	4.83	2.85	20.23	19.25	225	224	3 16 1

* Contains 0.20 potash.

LIST SHOWING RESULTS OF ANALYSES OF SAMPLES OF ARTIFICIAL MANURES, ETC.—*continued.*

Label No.	Official No.	Description of Manure.	Manufacturer or Importer.	Moisture.	Nitrogen.		Phosphoric Acid.		Mechanical Condition.				Net Weight Found.	Net Weight Guaranteed.	Estimated Value per ton.
									Fine.		Coarse.				
					Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.			
				%	%	%	%	%	%	%	%	%	lbs.	lbs.	£ s. d.
291	19712	Bonedust	Cuming, Smith, and Co., Melb. ..	8.16	2.40	2.50	19.74	21.00	25.50	35.00	74.50	65.00	..	224	4 8 0
290	19718	"	" " " ..	8.96	2.75	2.50	22.93	21.00	33.00	35.00	67.00	65.00	..	224	5 3 10
*294	19723	"	" " " ..	9.07	2.25	2.50	21.61	21.00	38.90	35.00	61.10	65.00	..	22	4 15 11
260	19521	"	Renard Fertilizer Coy., Melb. ..	6.31	2.63	3.80	2 .50	20.00	47.40	50.00	52.60	50.00	..	224	5 1 7
88	19102	"	P. Rohs, Bendigo	8.47	3.99	3.76	21.25	22.00	25.50	33.80	74.50	66.20	221	224	5 8 8
247	19444	"	" "	9.74	3.64	3.76	22.85	22.00	23.50	33.80	76.50	66.20	221	224	4 9 9
274	19675	"	" "	9.12	4.07	3.76	22.29	22.00	31.50	33.80	68.50	66.20	..	224	5 14 8
248	19446	"	A. Day, Bendigo	11.61	3.91	4.12	18.30	21.25	22.40	..	77.60	..	..	..	4 17 6
297	19676	"	E. Owen, Allansford	11.56	4.56	3.47	23.78	23.75	18.50	38.00	81.50	62.00	..	224	6 0 5
256	19449	"	Heinz Bros., Ballarat	8.83	3.01	3.02	20.50	22.41	56.50	49.69	43.50	50.31	..	224	5 4 6
233	19397	"	Aust. Explosives and Chemical Coy.	7.27	2.47	3.00	17.81	18.25	42.00	35.00	58.00	65.00	..	224	4 8 0
254	19148	"	J. R. Jopling, Ballarat	9.17	3.33	3.97	24.47	20.65	31.50	18.45	68.50	81.55	..	224	5 14 6
259	19525	Bonedust, Mngl. ..	Geo. Gardiner, Geelong	6.62	1.59	3.00	14.72	16.17	40.30	57.47	59.70	42.53	..	224	3 6 4
289	19612	"	" "	11.27	2.52	3.00	17.38	16.17	35.55	57.47	64.45	42.53	..	224	4 3 7
276	19611	"	" "	5.95	2.10	3.00	16.64	16.17	55.30	57.47	44.70	42.53	..	224	4 0 11
245	19453	Bonedust	J. R. Elsworth, Ballarat ..	12.86	3.05	3.00	19.58	20.00	40.70	35.50	59.30	64.50	..	224	4 17 7
288	19614	"	J. W. Branch, Geelong	8.48	4.42	3.48	15.36	14.38	36.60	..	63.40	..	..	..	4 16 2
292	19615	"	" "	8.36	5.09	3.48	14.33	14.38	35.50	..	64.50	..	..	..	4 19 3
257	19450	Bonedust, Waddell ..	J. Kitchen and Sons, Melb. ..	13.65	3.93	3.00	17.30	18.00	28.60	38.00	71.40	62.00	..	..	4 15 10
236	19275	Bonedust	A. E. Kleiner, Wangaratta ..	6.64	3.83	3.53	23.50	20.80	23.70	..	76.30	..	112	112	5 13 10
285	19709	"	Geo. Benson, Warrnambool ..	10.36	3.60	..	22.27	..	11.20	..	88.80	..	..	..	5 4 2
286	19708	"	W. Moore, Warrnambool	11.35	3.85	3.86	23.42	23.25	9.70	10.46	90.30	89.54	..	..	5 9 8

* This bonedust contains superphosphate.

LIST SHOWING RESULTS OF ANALYSES OF SAMPLES OF ARTIFICIAL MANURES, ETC.—*continued.*

Label No.	Official No.	Description of Manure.	Manufacturer or Importer	Moisture.	Nitrogen.		Phosphoric Acid.								Potash.		Net Weight found.	Net Weight Guaranteed.	Estimated Value per Ton.
							Water Soluble.		Citrate Soluble.		Insoluble.		Total.						
					Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.			
							%	%	%	%	%	%	%	%	%	%		lbs.	£ s. d.
280	19711	Grass Manure (top dressing)	Cuming, Smith, and Co., Melb.	11.99	1.41	1.50	16.90	17.57	1.25	0.92	2.76	1.39	20.91	19.88	..	..	..	224	5 9 7
281	19722	Potato Manure ..	" " "	10.84	1.18	1.06	9.64	8.21	5.31	3.63	5.79	8.53	20.74	19.37	3.75	5.40	..	224	5 14 8
275	19613	Grass Manure ..	Mt. Lyell M. and R. Coy., Melb.	9.71	..	..	6.52	7.00	13.07	11.00	1.27	1.00	20.86	19.00	0.70	1.00	..	224	4 9 2
279	19719	" " ..	" " "	11.32	..	..	5.13	7.00	14.45	11.00	1.78	1.00	21.36	19.00	0.05	1.00	..	224	4 11 6
63	19269	Grain Manure ..	Aust. Chemical and Explosives Coy., Melb.	11.[illegible]	..	..	10.74	17.00	6.91	0.50	2.37	1.50	20.02	19.00	0.14	0.75	..	..	4 3 11
262	19522	Potato Manure, Standard Flag Brand	Renard Fertilizer Coy., Melb.	5.48	1.29	0.90	7.10	9.30	7.43	3.40	1.09	..	15.62	12.70	2.72	2.50	..	112	4 13 3
265	19523	Pea Manure, Standard Flag Brand	" " "	1.48	0.39	0.50	0.38	3.00	16.17	11.00	2.26	2.00	18.81	16.00	2.60	2.90	..	224	4 11 6
59	18996	Grass Manure ..	Colonial Manures Coy., Melb.	12.97	1.19	1.00	..	..	12.55	10.00	4.26	2.00	16.84	12.00	2.60	2.50	..	..	4 9 6

W. PERCY WILKINSON,
Acting Chemist for Agriculture.

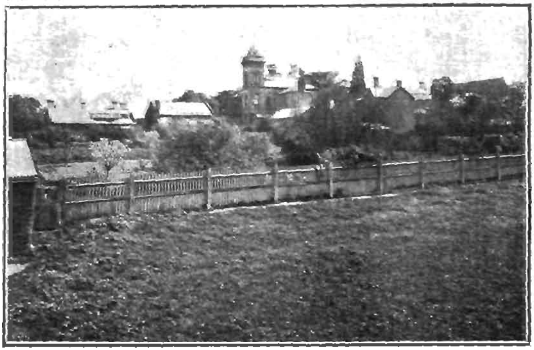
Government Laboratory,
Melbourne, 1st October, 1907.

CLOSER SETTLEMENT STUDIES.

A Suburban Dairy Farm.

J. M. B. Connor, Dairy Supervisor.

Business ability amongst farmers in general, and producers of specialities in particular, is more common than is generally recognised. This has been demonstrated again and again in the successful management of small areas, where intense cultivation has been thoroughly gone in for, and a systematic rotation of fodder crops grown and maintained on strictly business lines, the underlying principles of the work undertaken being always borne in mind. The feeling amongst small holders in favour of intense cultivation is rapidly gaining ground, the system having already accomplished more than has been claimed for it, as shown by the handsome returns obtained from the small area described in this article.



GENERAL VIEW OF THE HOLDING.
Small grazing paddock and shelter shed in foreground.

The "farm" in question has an area of about two acres, and is owned and cultivated by Mr. W. F. Darke, of Church-street, Richmond, an enthusiastic and practical worker, who does not spare himself when there is any work to be done. His methods are plain and simple, no expensive tools are used, and in fact no effort is made for the mere sake of appearance. His accounts are kept in two books, an expense book and a sales book. The former contains a complete record of both household and farm expenses, and the latter records all sales from produce of cows, orchard, and poultry yard; giving in each instance the date of the transaction and the price obtained. These accounts are balanced from time to time, and are closed at the end of the year. It is an effective system for keeping an account of the income and expenditure without much trouble. Everything sold from the farm is credited to it, and everything paid out in any way in its management is charged against it. The

advantage gained by the system adopted by Mr. Darke lies in the fact that it shows exactly the returns not only from the farm but also from each particular crop or product, and it is a very valuable record to have on a small farm especially in the case of mixed farming where saleable products are numerous and diverse. A careful record of the year's work might show that several of the cows were expensive luxuries and that some crops were being grown at a loss.

The two acres of land under review are subdivided into five small paddocks varying in size from less than a quarter of an acre to one acre in extent. Half an acre is laid out with profitable fruit trees, the space between the rows being utilized in growing fodder crops. Each paddock is provided with an adequate water supply. The crops grown on the farm, with the purchased foodstuffs to the extent stated below, have maintained three cows, one hundred fowls, twenty ducks, returning £100 12s. 5d. as the year's income, *i.e.* over £50 per acre, in addition to the produce used by the household.

Receipts.				*Expenditure.*	
Milk	£93	6	8	Purchased foodstuffs ...	£15
Poultry ...	21	3	3	Casual labour ...	2
Fruit	3	2	6		
	£117	12	5		£17

How the Land is worked.

The satisfactory result mentioned has been brought about by always having abundance of green nutritious fodder crops growing for the cows, irrespective of the seasons, by means of intense cultivation, rotation of crops and a plentiful supply of water. The crops grown in season are as follow, viz.:—Maize, sorghum, barley, oats and tares, or mixed oats and barley, mangolds, sugar beet, potatoes, and vegetables. In addition there are permanent plots of clover, prairie grass, and English grasses. Mr. Darke believes that a combination of barley sown with oats or tares produces a heavier forage crop than anything else that can be grown for early consumption. Owing to the difference of habit of growth in point of quickness of growth and stooling properties, the barley matures more rapidly, and provides the greatest bulk of feed the earliest; the oat crop comes on later and stools out freely, not only prolonging the feeding period but having the additional advantage of providing an appetising change in food. Mr. Darke is satisfied from experience that a crop of oats or barley mixed with peas or tares provides a heavy yielding crop in well balanced proportions as a general ration for producing milk and at the same time keeping the cows in good heart and condition.

The land is heavily manured at a trifling cost and brought to a high state of fertility by the following system:—Last year in the way of manure, besides what was made by his own cows, eight loads of wood siftings (from the local wood siding), delivered at one shilling per load were bought. These were all sieved by Mr. Darke and put into two heaps, wood chips which were used for household use and wood dust which was daily sprinkled thickly under the fowl roosts and cleaned out every morning with the fowl droppings and put into a heap with the cleanings from the cow bail. A few cartloads of elm leaves gathered from the streets were packed and allowed to rot and form leaf mould; a couple

of loads of sand and a few loads of street sweepings were also secured, the whole, with the exception of the wood refuse costing nothing but his own labour. The various manures were all well mixed before being used. The land was then thoroughly trenched to a depth of eighteen inches, and given a heavy dressing of manure in the trench prior to sowing the respective crops.

Barley and tares are sown early in February and watered, the oat crops in March, April, and May. No further sowing is undertaken until August when maize, mangolds, and sugar beet are sown, and as soon as one crop is harvested another is put in, two crops being taken off the same land each year. The last crop of maize was sown during January, and lasted until the winter. The grass plots are cut three times yearly, during the autumn, winter, and spring, and are top-dressed with manure between each cutting. The crops are all forced when required by water with sprinklers, and the expense is *nil*, as the quantity used is kept within the rating limit.

How the Cows are Managed.

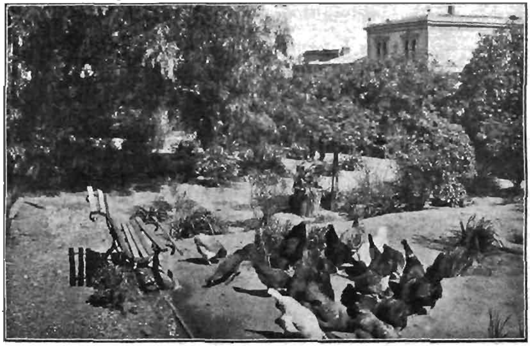
The three cows now in milk are of no particular breed, being a cross between the Ayrshire and Jersey strains; they were bought for £30, and

In Pleasant Pastures.

are never allowed off the premises. When freshly calved they yield from twelve to fourteen quarts of milk each, daily, and average twenty quarts daily during the milking season of ten months. The whole of the milk is sold at 4d. per quart. The cows are not allowed to become in calf until they have been milking for at least three months; then they are milked for seven months and turned out for two months before again calving, thereby keeping them in profit for ten months of the year. By this means the owner finds he has only to sell and replace his cows about every three years, a good deal depending on the age of the cow. They are fed at regular intervals four times daily, during milking hours and at 11 a.m. and 9 p.m. respectively. On one day each week, they receive one kerosene tinful of boiled potato skins (thrown away by most people)

mixed with one bucketful of brewers' grain, the same quantity of chaff, and two dippersful of bran, divided equally amongst the three cows. For the balance of the week the fodder consumed is 1 bag of chaff, costing 2s. 6d. per bag, 2 bags of brewers' grains, costing 1s. 6d. per bag, 3 bushels of bran, costing 8d. per bushel. The amount of feed purchased varies during the year according to the supply of other fodders grown under intense cultivation, but the total cost of outside feed does not exceed 7s. 6d. per week, and then only for short portions of the year.

The grasses are cut three times each year, and until they have wilted in the sunshine for a few hours, are never fed to the cows; this precaution is adopted to avoid any fear of the cows bloating. Half an hour each day they are allowed to graze in one of the small grass paddocks, and are then turned back into a nicely sheltered small paddock until milking time. The owner bought six loads of meadow hay from the park close by and cured it on the premises at a total cost of £1 2s. od. The hay is stored in 150 clean bran bags; by this means it is kept free from dust and mice, is safer in the event of fire, and the handling of it is facilitated when required for use. Rock salt for the cows to lick is always available in a convenient place.



A SHELTERED POULTRY RUN.

The cows are in splendid condition, thoroughly contented and nicely rugged. When they are brought into the bail to be milked the rugs are removed, and just before milking operations the owner washes his hands. The flanks and udders are washed with a clean damp cloth and thoroughly dried, a separate towel being used for each cow. A light clean hessian covering two yards square is then placed over each cow, to prevent the flies from annoying her, or any dust or dirt from falling into the bucket and contaminating the milk. The first squeeze of milk from each teat is thrown away. The milk after being drawn from the cows under these cleanly conditions is taken to a nice clean brick dairy, partly lined with white tesselated tiles and is there thoroughly strained into white enamelled milk dishes, and allowed to stand until served to the customers. The

utensils are thoroughly scrubbed with boiling water and soda, and placed out in the sunshine on a rack made for that purpose, thereby keeping them sweet and free from germ life.

THE POULTRY.

Upwards of 100 fowls are kept, comprising Brown Leghorns, Buff Orpingtons, Langshans, and until recently 20 ducks. The owner goes to no end of trouble to keep his stock clean and free from vermin. The brick fowl house, which is limewashed at intervals, is cleaned out daily, thickly dusted with wood siftings, and is a treat to look at. The roosts are scorched twice a week by running lighted paper along them, and the brick floor washed out at intervals and sprayed with phenyle. The returns for twelve months from eggs and young stock sold amounted to £21 3s. 3d.

THE ORCHARD.

The orchard contains a nice lot of profitable fruit trees, well pruned and cared for. Last season the produce sold amounted to 8 cases Japanese plums, 1 case walnuts, 2 cases apples, 2 cases pears, 7 dozen oranges, 3 dozen lemons, 3 cases quinces, and 1 case damsons, the total value being £3 2s. 6d., irrespective of what was used for household requirements.

FOUL BROOD OF BEES.

R. Beuhne, President, Victorian Apiarists' Association.

Foul brood is, as the words indicate, a disease of the brood or larvæ of bees, although to some extent the adult bees, under certain conditions, are also affected. The destruction of colonies of bees is usually brought about by the failure of the brood to survive the chrysalis stage in sufficient numbers to replace the adult worker bees dying a natural death, and thus a colony affected with foul brood dwindles away more or less rapidly according to the greater or lesser virulence of the disease affecting the larvæ.

To describe the appearance of brood affected with this disease, so as to enable any one not well acquainted with bees and their habits to detect it, it is necessary to first describe the appearance of healthy brood. If a brood comb is examined there will be found cells with eggs in them, and others containing grubs of all ages from the newly hatched larvæ of the size and shape of the small "c" of ordinary print to the large grub completely filling the lower part of the cell. There are also cells, covered over with a cap, which contain brood in all stages from the full grown grub to the young bee ready to gnaw its way out and emerge from the cell. If the brood is healthy the grubs have a pearly white appearance with a glossy and tight-looking skin, and the cappings of the covered cells are the shape of a watch glass or at least straight.

When foul brood is present some of the grubs will be yellowish in colour, flabby looking and not curled up so much, while the cappings will be flat or sunken and perhaps here and there show irregular holes. If these cells are opened a brown mass is visible which when probed with a straw or match is of a gluey or ropy nature. This ropiness or brown

matter is the principal means of identifying the disease, and should be looked for whenever the unhealthy appearance of the grubs or the sunken or perforated cappings of sealed brood cells gives rise to suspicion. I should like, however, to point out that some of these symptoms, or all of them excepting the ropiness, may be present and yet the case may not be one of foul brood but one of starved, chilled or overheated brood which with the disappearance of the cause will right itself. The brood of a colony of bees which from any one of these causes is in an abnormal condition is, on the other hand, very liable to infection should the germ of the disease (*bacillus alvei*) be introduced into the hive, and it is therefore well to watch for developments and occasionally to examine it by probing any sunken, suspicious looking cells.

Black bees are more predisposed to foul brood than Italians or Cyprians; at any rate, from some cause or other they contract it frequently whilst, on the same spot and under the same conditions, Italians keep free from it. This fact is probably due to the lesser inclination of black bees, as compared with Italians and Cyprians, to remove foreign matter, dead larvæ, and intruders from the hive. As an illustration of this a brood comb from a colony of black bees infested with the grubs of the wax moth, when given to a colony of Italians, will be promptly cleaned of the wax moth grubs.

Foul brood is now pretty well distributed all over Australia, with the exception, perhaps, of Queensland, or portion of that State. It is more or less virulent in different localities according to the different conditions of season and food supply or the hereditary constitutional vigour of the race and strain of bees. Practically, the rules which apply to animal life in general in connexion with diseases, also apply to bees. Where constitutional weakness, semi-starvation, unsuitable food or abnormal conditions of temperature exist, it only requires the introduction of the germ to cause an outbreak of disease; and in combating foul brood it is necessary to bear these factors in mind, otherwise success in treatment will be merely a matter of accident and cannot be expected with any degree of certainty.

TREATMENT.

There are three methods of dealing with foul brood, viz.—

1. Destruction.
2. Elimination of the disease.
3. Chemical treatment.

1. The destruction of bees, combs, hive and fittings is of course an effective method and where only one or two hives are affected and the disease is of a malignant type it is perhaps the quickest and best method to adopt. It is, however, wasteful, as the bees, wax, hive and frames destroyed have a value of from 10s. to 30s., and the utter destruction of the diseased colonies is no guarantee against the appearance of the disease in other and new hives even though all hives, healthy as well as diseased, are destroyed. Destruction, usually brought about by burning the hive, bees and all, after all the bees have returned for the night, is therefore not to be commended, except for an odd case of a virulent nature.

2. The elimination of the disease is effected by removing the bees from the infected hive and combs. Put them in a temporary hive placed on the spot occupied by the old one previously, and leave them without food for 24 to 48 hours but with the exception of the queen allow them

liberty. The queen may be caged* to prevent the bees swarming out and absconding, or, as they will sometimes do when deprived of brood, entering a neighbouring hive. After the lapse of 24 hours they may be fed with syrup made by dissolving sugar in an equal weight of boiling hot water, the syrup to be given warm (about blood heat) and if there is a scarcity of nectar not till after sunset so as to avoid attracting robber bees from other hives. If a honey flow is on, feeding may be dispensed with. In three to four days the bees will have built some pieces of comb on the bars of wood which instead of frames have been placed in the hive and from which the cage containing the queen is suspended. The bees may now be returned to their former hive which in the meantime has been thoroughly cleaned by being immersed for several minutes in boiling water in which soap and soda have been dissolved, and allowed to dry in the open air. If the same frames are to be used again they should, after the combs have been cut out and boiled down for wax, be treated in the same way. When properly dry the frames are supplied with starters or full sheets of foundation. The temporary hive is moved aside, the cleaned hive with the frames put in its place, and the bees transferred to it by shaking them out on to a cloth placed in front. The queen may be kept caged with advantage for a day or two more till the bees have again settled down and commenced to build comb. If any comb has been attached to the cage it will be best to transfer the queen to a fresh cage. The comb built by the bees during their stay in the temporary hive is treated as infected and boiled down.

If the bees cannot obtain a liberal supply of nectar from flowers immediately after this treatment feeding should be continued for a while, because although they may not be actually starving it is necessary that they should raise the greatest possible amount of brood immediately after being established in the clean hive, otherwise the small number of bees emerging from the new combs after twenty-one days will not be sufficient to replace the old bees then rapidly disappearing from old age.

It is not absolutely necessary that the bees should build their own combs. Instead of frames with foundation, finished combs, stored with honey and pollen, may be given from clean hives which have a surplus and as soon as there is brood in these a comb of sealed brood from another hive may also be given them. This will dispense with feeding and prevent the colony declining too much during the first three weeks after treatment.

* The cage employed for this purpose should have an opening, covered with a piece of queen-excluding zinc such as is used in honey boards which will prevent the queen leaving the cage but will allow the workers access to it. Otherwise the bees are to all intents and purposes queenless and may leave the hive.

(To be continued).

RAPE AND FODDER CROPS FOR LAMB RAISING.

H. W. Ham, Sheep Expert.

Rape and barley, rape and oats, turnips, &c., for turning ewes on to just after lambing, with the object of getting the lambs away at about four months old are being found most profitable crops and at the same time a means of cleaning and manuring for successful grain crops to follow is secured. To be most profitable, an effort should be made to have these fodder crops well established just as the lambs are from two to three weeks old. A mistake often made is, that the crop is fed off too soon; it should be stocked up about three weeks or a month before commencing to run to seed. A few sheep to even off the crop may be allowed on all along, but never to the extent of checking it. Rape and barley in some districts are found to produce the greater amount of feeding from start to finish, and when there is a grass paddock close by for the ewes to go into, or a straw stack that they can get at, the sloppiness of the rape in showery weather is counteracted. The best results in fattening sheep and lambs have been obtained when the sheep have had access to pea-straw while on rape and barley. Rape and Algerian oats also give a large amount of feeding. Oats finish best, being good feed when out in ear, but with barley it is not so. Rape alone is monotonous, and sloppy in showery weather; mustard, if added, is of advantage to counteract this, but is usually eaten out early, and, with first showers after being eaten out does not come again with the rape. A mixture of barley or oats with the rape, together with a straw stack or pasture for them to go to is preferable.

Nothing gives more feed in root crops than turnips, and this crop also allows of a fair area to be grown. Further there is no other crop that will make the sheep leave more manure per acre. In a crop sown under right conditions, the tops come equal with the rape, although when once eaten down will not shoot again like rape. Turnips and rape together give a lot of excellent feed and will fatten a surprising number of sheep, especially if they have access to good pea or oaten straw.

In forward oaten and wheaten crops, when sown with fertilizers, it is possible to fatten off a few lambs all through the winter. Care should be taken not to check the crops too much, and the sheep should be removed when the paddocks get very wet. The fattening is especially possible when the paddocks have been sown to rape the season before. In the latter case, a forward crop is assured, and it is then found to advantage to keep it in check by a few ewes and lambs being fattened on it. It will, when done with care and good judgment, also assist in improving the quality of grain, there being less straw and flag to be fed by the fertilizer through winter and spring. When rape is sown with the object of running it through the summer to catch showers for summer feed it is best sown with fertilizers in early spring. It must be watched closely, and stocked with ewes and lambs or store sheep, just as the foremost part of the paddock shows the smallest signs of seeding in the fork of the leaves. When this is checked and eaten down sufficiently to stop the seeding, the roots will be thoroughly established, and the paddocks can be eased off with the object of running it through the summer.

Rape and barley should be sown through the drill. Sow half bushel barley per acre, through the seed run, and four pounds rape per acre, if

land in fine order (more if rough), through the fertilizer run with 80 to 100 lbs. of fertilizer, bonedust for preference. The bonedust as well as being a fertilizer is coarser and the rape goes more equally through the manure run with it. If it is decided to sow bonedust the rape can be mixed on the shed floor at the rate say of 4 lbs. of rape to 100 lbs. bonedust, and shovelled up together into bags ready to use at any time, but, if superphosphate is decided on only enough should be mixed for each day's using; if left long together it has been found to destroy the germination of the rape. If it is desirous to sow rape in March before *sufficient rain has come, bonedust should be used, as the rape can then be left in the ground with it until rain comes without ill effects.* The hoes of the drill should be set just sufficiently deep to bury the rape and barley &c. and then rolled heavily. Sowing rape broadcast on top of the ground is to be discouraged; the best results have been gained when put through the drill with the fertilizer, and then heavily rolled to set the soil round the seed to keep the air out.

RAPE, 18½ TONS PER ACRE.

Rape and turnips can also be sown through the manure run of the drills with fertilizers, bonedust for preference for turnips and small seed. Rape and turnips have both come successfully through one and a half inches. The finer the soil the better, and the less seed required; the rougher the soil the more seed is needed, for a lot will not germinate. Rolling is very necessary.

In some instances it may be found best to sow one bushel of oats and about three pounds of rape per acre in March or April. This should be fed off all the winter, and just as spring commences take all sheep out and give the paddock a good cross harrowing, and the oats, especially if sown on fallowed land, will come ahead and give a good yield of clean seed grain. What rape comes to seed can be cut with the oats by the binder as it will be fine stalked. In threshing

the rape goes out with the second grain and straw and never affects the good grain. This has been found in some circumstances to be profitable in two ways, first by getting lambs off and then putting the ewes right out to grass for rearing lambs another season, and secondly the yield of oats has been as high as eight bags per acre.

With those who have the means for making ensilage, the crop from one bushel of oats and three pounds of rape can be used by cutting it when out in ear when the lambs go in August and September. Kale gives a lot of excellent feeding, and is warm and does not scour as rape does, but it is troubled with blight in warm districts. Rainfall, cold and hot climates, aspects of paddocks, closeness to markets &c., vary the objects for, and times of sowing these crops, and it will be for the reader to exercise judgment in suiting the information given to his circumstances.

GARDEN NOTES.

J. Cronin, Inspector, Vegetation Diseases Acts.

The Lily.

Lilium—the lily, designated the queen of bulbous flowering plants, is a genus of herbaceous perennials, found native, in temperate parts chiefly, in Europe, Asia, and America, a number of the finest kinds being natives of Japan and California. There are about 50 distinct species in cultivation, in addition to which there are a number of varieties of some of the principal kinds. The lily is certainly one of the finest genera of plants cultivated, the principal factors that conduce to its high position in the esteem of horticulturists being the variation in height of the various species, the large and beautiful blooms of many and gorgeous shades of colour, and the long period during which the many kinds produce their flowers.

A few kinds are grown in gardens in many parts of this State, the most generally noted being *L. candidum* (the Madonna lily), *L. longiflorum* (the Christmas lily), *L. tigrinum* (the Tiger lily), and *L. speciosum*, commonly known as the Japanese lily. These kinds thrive under extreme conditions of climate and soil, and many others are equally hardy. At Macedon, Wandin, and other mountainous districts near Melbourne, fine clumps of lilies of various species are grown, including the splendid *L. auratum* (the golden-banded lily of Japan), and produce quantities of beautiful flowers in season. In the cool districts many kinds of lilies would succeed in almost any position, but would be difficult in the hotter parts of the State unless grown under special shade conditions.

Soil and Situation.

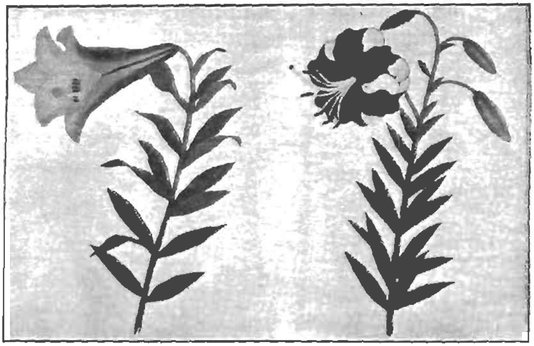
The most suitable soil for the majority of lilies is a light and open loam that is thoroughly drained. A few kinds require a sandy, peaty soil to

bring them to perfection but as a whole they thrive fairly in a sweet, unmanured, light garden soil. The most common cause of failure is undoubtedly the addition of fermenting animal manures to the soil they are grown in. Poor soils benefit by the addition of leaf-mould, or some very old cow manure in moderate quantity, but even in such soils if unmanured a fair measure of success is certain; while, if heavily manured with gross manure, the bulbs are nearly sure to fail.

A situation where the ground is shaded partially from hot sunshine is an important consideration. The majority of the lily family are found growing in forest regions and in garden practice it is found that they thrive best when lightly shaded from hot sunshine by being planted among dwarf shrubs or plants, or protected by a trellis. The earliest blooming kinds flower in spring, others succeeding them during summer and early autumn, and root action again begins after the flower stems die. In mixed groups and borders where the soil is maintained in a cool condition during summer many kinds will succeed if undisturbed by digging and other gardening operations, and the soil is sweet, fairly porous, and unmanured. An occasional top-dressing of well rotted leaf mould is beneficial.

Propagation and Planting.

Lilies are propagated from offsets from the parent bulb—small bulbils that are produced in the axis of the leaves in some kinds, and



LILIUM BROWNII.
White inside tube, chocolate without.

LILIUM TIGRINUM.
Orange scarlet, spotted purple.

occasionally, from scales of the bulbs. After the flowering is over and the stems die to the ground is the proper time to plant lilies and to effect an increase. The bulbs are practically dormant then, but soon begin to produce roots again for the following season, and an attempt to propagate after the roots are far advanced would result in damage to both bulb and offset. When the leaves on the flower stem have matured, the small

bulbils occurring there on *L. tigrinum* and other kinds are ready for removal. They should be planted in beds of light soil, where they may be allowed to remain until large enough to produce flowers. Propagation from the outer scales of the bulbs is resorted to by nurserymen to increase certain kinds. The scales can be removed without damage to the bulbs and are sown in the manner of seeds when small bulbs are formed which are grown on as in the case of bulbils.

Autumn is the general season for planting most lilies. Trade growers lift the bulbs at the right season, replant the offsets at once, and store the bulbs in a cool, dry place, often in dry sand, to retard root action. Where an increase of plants or patches is desired the plants should be lifted after blooming, and death of the stem, and be replanted at once, but, unless an increase is wanted there is nothing to be gained by disturbing the bulbs. Lily bulbs should be planted at a depth of six or eight inches, according to size of bulbs, species, and soil conditions. Large bulbs of the taller-growing kinds may be planted at a depth of one foot with safety in hot but well drained soils. Fair room should be allowed for each bulb when grown in patches, about eight inches being sufficient for most kinds. In florists' gardens some lilies are grown for the cut flower trade, the practice being to grow them in rows in cool soil and not to disturb them for years unless for sale of bulbs.

Selection of Kinds.

Several species of lilies may be procured from the local nurserymen or seedsmen, and will be found to be generally locally grown and acclimatized bulbs. Importing and acclimatizing lilies and other bulbous plants is not an amateur's work, and it is better to buy local bulbs. A fairly representative collection should include Liliums candidum, Brownii, croceum, Thunbergianum, longiflorum, tigrinum, and its varieties, splendens, and tigrinum fl. pl., auratum, pardalinum, speciosum, and varieties.

Flower Garden.

The absence of soaking rains during winter and spring in most districts will cause the death or failure of plants in places where water for gardening purposes cannot be obtained, unless special measures are taken to conserve the moisture in the soil at present. Frequent hoeing of the surface and mulching with stable manure are the readiest means of effecting this purpose. When water is available it should be applied in sufficient quantity to thoroughly moisten the whole of the soil. If followed by cultivation immediately after the soil is dry at the surface, such watering will suffice for weeks, but light sprinklings are of little, if any, benefit.

Flowering stems of delphiniums, phlox, gladoli, and other plants should be securely, but not tightly, tied to stakes as they develop. At this stage such plants will benefit largely by a supply of water or weak liquid manure.

Divisions of dahlia crowns, or young plants struck from cuttings, will bloom at mid-summer if planted now. For autumn blooming such planting should be deferred until late in December. A number of fine new varieties of cactus dahlias were imported by various nurserymen last season, and plants are available now. Several of the new kinds were exhibited at the autumn shows, among them being a few indispensable for

exhibitors of this popular flower. The best noted are:—Beauty, Ben Nash, H. Shoesmith, Iris, Mrs. McMillan, Mrs. H. Shoesmith, Nelson, William Marshall, Daisy, and Mrs. S. Gaskell. A few new Australian raised varieties are quite first class, and include:—Mrs. C. T. Richardson, T. A. Kerslake, Earl Likely, Simplicity, Mrs. Chas. Wood, and Miss Minnie Walker.

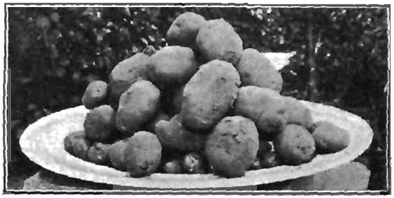
Bulbs of spring blooming plants such as hyacinths and others of a like nature, and also crowns of anemones and ranunculi, may be lifted after the foliage has died, and after being dried should be stored in a cool, dry place until planting season. Plants of various bedding kinds, and annuals raised earlier in season from seeds may be set out. Bulbs of gladioli may be planted, and seeds of tender annuals still sown.

Kitchen Garden.

Where water is scarce, the remarks in regard to conservation of moisture for flower garden apply here. In many places the subsoil has not been moistened during winter, and a supply of vegetables of fair quality cannot be expected unless moisture is present. The surface should be hoed regularly or mulched with stable manure.

As the early crops are harvested, the soil should be liberally manured and deeply worked in preparation for the succeeding sowing or planting. Rotation should be observed where possible. Advantage should be taken to plant out cabbage, celery and other plants raised earlier from seed when the weather is suitable. Seed may be sown of cucumber and other members of the melon family, lettuce, French beans, celery (to transplant), and saladings.

Lateral growths should be removed from tomato plants as they develop, and the leading shoots tied to stakes. When the fruit has set liberal watering will be beneficial.



FARM REPORTS.

QUARTER ENDED 30TH SEPTEMBER, 1907.

Wyuna Irrigation Farm.

G. H. Tolley, Manager.

Rainfall.—Although established as an irrigation farm it is regretted that up to the present water for that purpose has been almost unobtainable. The rainfall for the quarter has been:—July 1.91 inches, August .86, September .39. Whilst the intervals between rains have not been of long duration, the amounts registered have generally been a few points, and invariably each rain has been succeeded by continuous high winds.

Stock—Horses.—No addition has been made to the number of horses—4 draught and 2 buggy horses. They are in good condition and kept constantly at work.

Cows.—There are 45 cows, and the average number milked daily is 21. Calves have increased by 4 heifers and 2 bulls. The want of natural pasture has necessitated some feeding with bran and chaff, and on the 26th September the milkers were turned into a 30-acre paddock sown with peas and rape, as there was no hope of the crop coming to anything. From all appearances it seems likely that this course must be adopted to utilize as far as possible the remaining 140 acres of crops.

Pigs.—These are Berkshires and have done very well. There are now 3 brood sows, 2 of which are just ready for breeding. Of a litter of 8 young ones 4 sows are being retained for breeding purposes. The pigs sent to the Kyabram sales topped the market at £3 7s. each. A high-class boar was secured from the Kew Asylum stud on the 31st July.

Poultry.—At present there are only a few fowls and ducks, but it is intended to at once develop this industry.

Crops.—To obviate as much as possible the effects of the season the growing crops have been well rolled and harrowed, but it is now obvious that very little result will accrue; even with heavy rain the sanguine hopes of the early part of the season will not be realized. In every case germination was all that could be desired, and there is very little appearance of disease. Small areas of lucerne have been sown and land worked and graded for planting summer crops in anticipation of possible irrigation. Of the main area sown to lucerne (48 acres) 40 acres were irrigated from 16th to 21st September and have responded well. From the various cover crops sown with the lucerne it is anticipated that a fair amount of ensilage will yet be secured. The lucerne was sown in almost every conceivable way and with varying quantities of seeds and manures and will later on furnish a valuable object lesson. Provided the new channel from the Waranga Basin is shortly completed and irrigation made a certainty, a sufficient fodder yield to carry the stock through the summer is anticipated.

Tree Planting, etc.—About 300 shelter trees have been planted along the various boundary fences, and it is intended as opportunity offers to plant trees in every available spot. To this end trees are now being raised from seed in the farm nursery. The shelter trees and also the orchard trees are being watered by hand from time to time. A large number of rooted vines, shade trees, vegetable plants and herbs have been raised and distributed amongst the settlers. The orchard trees and trellised vines have made a good start. In the garden a constant succession of

vegetables is grown, water being available by means of a windmill, and the small flower garden and lawns are showing good promise.

Buildings, etc.—The new milking shed—to accommodate 22 cows—has been completed, and the adjacent yards substantially fenced. These are now being paved with bricks and in a short time will be ready for occupation. Arrangements are concluded for installing a milking machine plant, and plans for a brick dairy and separator house are nearing completion. The dairy will be fitted with a turbine separator and complete milk testing plant; an efficient water supply will be provided. The buildings are so designed as to admit of ready extension as required. Nearly all the old interior fences and useless buildngs on the farm have been removed and convenient yards and paddocks erected in their place. An ornate drive to the homestead has been fenced with sawn timber posts and planted with ornamental shelter trees. Considerable work has been necessary to maintain the old boundary fences, but these are about to be replaced by a substantial wire-netting fence.

Brickmaking.—This has proved a success; the sample turned out was of good quality and burned specially hard for paving purposes. The first kiln was fired on the 15th August and the second on the 27th September, whilst sufficient bricks are made to immediately fill a third kiln. Each kiln yields about 30,000 bricks. About 7,000 bricks have been sold to settlers and there are many inquiries for more. The plant used is known as a wire cut machine and has a capacity of 1,000 bricks per hour. The motive power is provided by the traction engine. The latter is simply invaluable for pulling down trees, ploughing, and scarifying, drawing heavy loads, shifting buildings, pumping, sawing, chaff and silage cutting, &c.

Sundries.—Nearly all the labour on the farm is done by settlers, and while none of it may be classed as skilled in the ordinary sense, little recourse to outside help for tinsmith, blacksmith, carpenter or building labour in necessary. The ordinary work of the farm beyond that already referred to comprises timber splitting for fencing and firewood, carting, drain making, repairing plant and harness. A new farm dray fitted with a large frame has been purchased.

Every advantage has been taken by the settlers to hire the farm implements—a convenience much appreciated. Models of grading tools have been prepared to assist lecturers and a complete set of grading tools was exhibited at Melbourne and other shows. Numbers of surveys have been made for settlers; irrigation ditches laid out, and advice given on irrigation subjects. A considerable amount of valuation for the Lands Purchase Board has also been done.

Educational.—Scarcely a day passes without some visitor seeking information or advice. Lectures have been given at the farm as follows:—

10th July, Demonstration "Tree Pruning," G. H. Tolley.

30th July, "Pig Raising and Bacon Curing," W. Smith.

24th Aug., "Diseases of the Horse," W. J. Colebatch, B.Sc., M.R.C.V.S.

27th Aug., "Artificial Fertilizers," F. E. Lee.

Board.—During the quarter the Advisory Board met at the farm on 5th July and 27th September; and in Melbourne on 6th September. On 26th September a large number of settlers assembled to meet the Hon. Geo. Swinburne, M.L.A. (Minister of Agriculture and Water Supply) and the Hon. D. Mackinnon, M.L.A., to explain their difficulties in securing a supply of water.

Heytesbury Farm.

O. H. Call, Manager.

Ploughing, etc.—As early as possible after the land was cleared of growing crops every advantage was taken to get the ground ploughed and exposed to the weather for as long a time as possible before resowing. In ploughing small (narrow) lands were made and the land ploughed up leaving the furrows between as deep and clear as possible to take off any surplus water. The whole of the ground turned up very well, but was full of roots and grass tree rubbish; as a proportion of this is still growing it must prove harmful to any crops, besides keeping the ground sour. The best results will not be obtained until the roots and rubbish are all picked up. As the scrub was getting very unsightly on portions of the farm which had not been ploughed, principally along the fences and drains dug before the ploughing was done, it has been removed and will be burnt up as time permits. Advantage was taken of a spell of dry weather to clean out the bottoms of the open drains which were getting dirty with rubbish falling in.

Orchard.—On 26th July a small orchard was planted out with 55 assorted trees, which are all doing well. Small fruits, comprising strawberry, gooseberry, raspberry, red and black currant, and blackberries, were planted out near the house at the end of August. They have struck well and promise to make good growth.

Crops.—Weather conditions have not been favorable to growing crops, as with the exception of a few warm days early in September it has been very rough and cold. Manure for this season's cropping has just come to hand, but owing to weather conditions has not yet been used on any of the land. Last week a land of rye was cut and stacked as ensilage. A small stack 9 x 9 x 7 was built and weighted with timber and will be referred to in a later report. Three acres have been prepared for more oats which will be put in as early as the weather will permit, and three acres are ready for peas to be sown as soon as the oats are in. Three acres which were sown in rye, barley, and vetches are being ploughed in readiness for potato planting about the middle of November. The growing crop of Algerian oats is looking only fairly well, but if the warmer weather comes soon it will be satisfactory. The grass plots are doing remarkably well, but the clovers and lucerne are still backward.

Stock.—Another horse has been added to the farm stock which are all doing well.

NOTICE TO IMPORTERS, MANUFACTURERS, VENDORS, AND DEALERS IN ARTIFICIAL MANURES.

Attention is directed to Section 18 of the Artificial Manures Act 1904, and Section 2 of the Amending Act of 1905 which prescribe that samples of manures which are to be offered for sale during the coming season must be submitted during the months of October or November to the Chemist for Agriculture, together with the usual declaration, and regulation fee for analysis.

GEO. SWINBURNE,
Minister of Agriculture.

23rd October, 1907.

EGG PRODUCTION AND COOL STORAGE.

H. V. Hawkins, Poultry Expert.

Throughout the wide world eggs have gradually increased in value during the past five years. Each year new industries in which the egg plays an important part are being inaugurated. Consequent on the coming into operation of the Pure Foods Act in this State there will be an increased demand for eggs. Formerly thousands of tins of egg powders were used by pastrycooks and others but now the authorities demand, and rightly so, that "light pastry" shall be unadulterated. This means that eggs must be used and the question naturally arises "Where are they to come from?" The answer should be "Out of the Cool Stores."

Is it not time that the poultry farmer, who often pays big prices for his foodstuffs, should make an effort to protect himself? He disposes of his eggs at 5d. and 6d. per doz. instead of utilizing to the fullest extent the benefits which cool storage offers to him. If poultry breeders would only co-operate the price of eggs should never be less than 1s. per doz. Mr. Crowe, Superintendent of Exports, states that practically the whole of the eggs produced in this State will be required by the local factories and consequently few, if any, will be left for export. This to my mind is a good sign as it will be possible in a very short time to increase the output. The low price obtained from the storekeeper for eggs is a matter which greatly concerns the producer. Now that the latter knows there is a good demand at remunerative rates he should arrange to deal direct with the Co-operative Butter Factories some of which are already collecting eggs as well as cream.

The dry season that has set in will be an opportune one for factory managers to reserve cool space for eggs and thereby minimize the decrease of receipts occasioned by the shortage of cream. If complete success is to be attained nothing but *infertile* eggs, absolutely fresh, should be placed in cool storage, the temperature of which should be from 30 to 32 degrees Fah. The chamber must be kept free from all foreign odours and if so the eggs will turn out after a lapse of four months as fresh as when first stored, with the exception of a very slight evaporation. When egg preservatives are used the white of the egg becomes darkened and there is a peculiar taste, quite different to those kept in cool storage.

The cost of storage is infinitesimal as compared with the higher prices realized later on. The charges at the Government Cool Stores, Flinders-street, Melbourne, are as follow:—

Per case of 25 dozen,	for first two weeks or portion thereof ...	4d.
,, ,,	for each additional week or portion of week ...	2d.
Per case of 36 dozen,	for first two weeks or any portion thereof ..	6d.
,, ,,	for each additional week or portion of week ...	3d.

Whilst the local outlook is bright it must also be remembered that there is a good market in Great Britain for any surplus that we may have. Victoria is peculiarly adapted for poultry keeping. An advance of this industry has taken place in recent years but is trifling to what may be reasonably expected in the near future. The following figures,

which have been compiled from the latest returns, will give some idea of the exports of other countries:—

EXPORT TRADE OF VARIOUS COUNTRIES.

Country.	Year.	Eggs.				Poultry.		Total Values, Eggs and Poultry Exported.
		Total Export. Quantities.	Total Export Values.	To United Kingdom. Monthly.	To United Kingdom. Values.	Total Export. Values.	To United Kingdom. Values.	
		Gt. Hds.	£	Gt. Hds.	£	£	£	£
Europe—								
United Kingdom	1906	..	..	..	..	28,938	..	28,938
Austria ..	,,	100,124 tons	3,760,466	4,856 tons	182,382	620,415	*16,250	4,380,881
Belgium ..	1905	1,207,636	472,716	152,620	62,276	35,153	3,770	507,869
Bulgaria ..	,,	10,042 tons	364,507	36 tons	1,601	..	..	364,507
Denmark ..	,,	3,455,000	1,368,062	3,393,333	1,343,770	..	..	1,368,062
France ..	1906	212,000 cwt.	559,000	180,000 cwt.	†474,500	598,300	‡203,714	1,157,500
Germany ..	1905	1,231 tons	67,700	88 tons	4,850	61,480	2,660	129,180
Hungary ..	1906	..	2,960,000	..	281,403	2,573,642	187,267	5,533,642
Italy ..	1905	652,912 cwt.	2,253,710	186,353 cwt.	643,253	547,253	88,780	2,800,963
Netherlands ..	,,	78,683 cwt.	150,000	11,132 cwt.	21,290	..	..	150,000
Portugal ..	1906	220,650	60,491	61,425	18,367	..	..	60,491
Russia ..	,,	26,941,666	5,615,200	7,132,925	2,344,256	300,000	185,035	5,915,200
Servia ..	1903	..	320,358	..	..	76,097	100	396,455
Spain ..	1905	331,445 kil.	10,035	331,445 kil.	10,035	..	..	10,035
Sweden ..	1906	..	..	141,444	54,783	..	..	54,783
Turkey ..	,,	..	..	28,083	9,200	..	..	9,200
Africa—								
Cape Colony ..	,,	62,750	43,282	..	114	628	148	43,910
Egypt ..	,,	520,691	108,815	505,141	105,566	..	..	108,815
Morocco ..	,,	97,693 cwt.	244,648	158,766	54,840	..	..	244,648
America—								
Canada ..	1905	..	148,505	..	..	13,764	..	162,269
United States	1906	495,206	216,385	18,257	2,026	201,042	268,023	507,427
Australasia ..	1906	513	121,268	..	1,000	6,662	652	127,930

* Nine months only, March to December, 1906.

† The figures given with respect to exports from France do not agree with the British Trade and Navigation Returns, which show the following values for 1906:—Eggs, £623,119 Poultry, £203,714; Total, £826,835.

‡ Taken from the Trade and Navigation Returns, 1906.

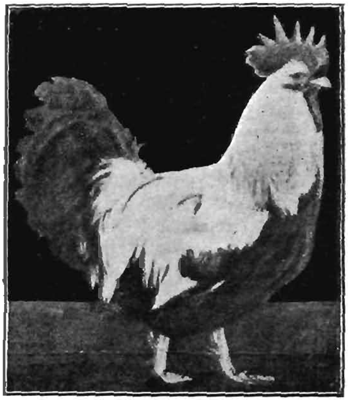
	Eggs.	Poultry.	Total.
Europe	£18,026,228 ...	£4,841,278 ...	£22,867,506
Africa	406,745 ...	628 ...	407,373
America	364,890 ...	304,806 ...	669,696
Australasia	121,268 ...	6,662 ...	127,930
	£18,919,131 ...	£5,153,374 ...	£24,072,505

THE SILVER DORKING.

H. V. Hawkins, Poultry Expert.

Silver Dorkings are pre-eminently English fowls, and take their name from the old-fashioned town of Dorking, in Surrey, which is the great centre of their production. Dorkings are fine, handsome birds of much avoirdupois, some of the male birds weighing 14 lbs. each, and in tenderness and succulence there is no fowl to equal them. In colour they vary from white to silver-grey and dark, but in all cases the skin and legs are white, two very necessary points for the table. A peculiarity of all Dorkings is that they have five toes on each foot. It is a breed of which England is rightly proud, and it is held in high esteem as the farmers' all-round utility fowl. It is also recognised by all the leading authorities as the breed *par excellence* for crossing purposes, and in addition it is a splendid layer, very many reaching 175 eggs per annum.

Although not as popular as many other varieties in the Commonwealth, its usefulness may be seen by the many excellent new breeds which have been built up by the introduction of the Dorking. One of the principles to be observed is to hatch the young in July, August, and September, *and no later*. Five second season hens are sufficient for one male bird, and he should be a vigorous cockerel about 10 months old and unrelated. Dorkings will not stand close breeding, and it is as well they do not, otherwise they would soon lose their size like the Silver Wyandottes recently exhibited, many of which were bred for feather only—even type appears to have been disregarded. Farmers have by far the largest specimens in many breeds, for the good reason that they do not usually exhibit, their one object being to obtain eggs or flesh.



SILVER DORKING COCK.

The Silver Grey Dorking hen is a perfect model in form. She walks and stands erect, her head well up, and has a fine tapering neck from the full flowing cape over the shoulders. The comb is single and of fair size, evenly serrated and falling over on one side in front part for about half the length, whilst the back half is straight up without twists or side sprigs. Although few hens have as perfect a comb as the one described it is the ideal bird, not only for appearance, but to breed from. It is important to have a good comb on the female for the sake of its influence in breeding for males, as well as females. Many a breeder has been disappointed in the combs of his male birds, when the fault has been due to the combs of the hens—weak combs, falling over the entire length, twisted, or side sprigs. These faults are too often overlooked in the hens. Ear-lobes, wattles, and face, should be bright-red, with smooth, even tenure.

The head is rather large but not coarse, and, with the neck, is silvery white. Feathering of neck full; and here Nature insists on one of her own prerogatives. The feathers of the neck have a dark stripe in the

centre and no amount of selection changes it with the other colours of the body; but the narrower the stripe the lighter is the colour of the neck. As the feathers approach the head the smaller the stripe, till the head feathers are all silvery white, and this is best without a tinge of brown towards the throat. The neck should be well arched, the full feathering sitting well over the shoulder. As in all Dorkings the eyes are red, or to be strictly correct, the colour is a deep orange or light red.

Body should be deep, long and broad: breast salmon colour, blending to grey on the sides. The term salmon colour, or salmon red, is often misunderstood; salmon colour is a reddish pink, softened on the Dorking breast with the least tinge of grey in it which gives it a subdued shade. The deep red of some hens is too dark for silver grey hens; that was the colour of the old "Grey Dorking" before the Silver Greys were bred. Too light or faint colours are also defective. A good, rich, soft, salmon colour, with as little light shafting and edging as possible, and

SILVER DORKING HEN.
Age 3 years 9 months. Record 615 Eggs.

entirely free from dark spots, or tip feathers, is the handsomest breast. A good evenly coloured breast is a point of great desirability in a Silver Grey Dorking hen. This colour is not found in any other breed of fowls, except Game and then it is seldom as rich. For the sake of getting light backs and necks, the breast colour is often overlooked or under-estimated in the Show pen. Many hens and pullets are awarded prizes on account of their backs, while their breasts are poor in colour. The breast colour should be more regarded, as it is a distinctive Dorking feature.

We now come to the colour of the back of the Silver Grey hen, which gives the name to the breed. It is not a solid colour, but when looking at it closely we see a very fine mottling of deep grey and light grey. On examining a feather we find it is made up of very fine etchings, short wavy lines and fine longish dots, neither round spots nor straight lines. Some term it pencilling, but pencilling is more applied to fine lines on the edges of feathers. This mottling is very beautiful and is seen in some species of wild birds especially game birds, but in none purer than in the Silver Dorking. The light and dark are about equal in quantity; when the dark predominates the colour

is defective. The shafts of the feathers are light, but the less conspicuous the better. Very few birds are seen without the light shafting; yet there is a possibility of breeding out the light shafts, so that the back would resemble a piece of broken steel at the fracture. There is reason to believe that this result can be brought about, as we have seen in Partridge Cochins, which once had light shafts to a great degree, but still no other quality should be sacrificed for the absence of shaft colour. I have seen small, inferior birds awarded first prize over large ones with good backs, fine in all other respects.

Many birds have lighter or darker tips to the feathers, which mar the even steel colour. A shade of brown or drab often appears, and in the latter part of summer most backs incline that way in the old faded feathers before moulting, but come out bright and clean in new feathers—under part of body and fluff are grey. There is a tendency on the shoulder and upper wing coverts to have a reddish tinge. This is a persistent feature of this breed and it should be avoided in the Show pen and bred out as much as possible at all times; it is gradually disappearing, but is a decided bore to breeders of Show birds. The wings should be closely folded and carried well up. Coverts and bow, silver grey with white centre lines. Primaries and secondaries, upper webs brown, lower webs slaty, mottled with grey. The tail of fair size to match the body colour, and carried in a fairly elevated position. The large feathers are grey on the outsides, dark brown on the insides. Thighs strong, also grey in colour. Legs white, and the fifth toe must be perfect in form and development. It will be seen that a bird with such fine colouring, form and size, is not one to be overlooked, for added to all this, it is a bird of fine carriage, graceful movement and symmetrical proportions.

THE PROCLAIMED PLANTS OF VICTORIA.

(*Continued from page 606.*)

Alfred J. Ewart, D.Sc., Ph.D., F.L.S., Government Botanist; and J. R. Tovey, Herbarium Assistant.

The Ragwort.

Senecio Jacobæa, Linn. (*Compositæ.*)

An almost cosmopolitan herb with a root-stock short and thick without creeping shoots. Stem two to four feet high, erect, scarcely branched, except at the top. Leaves divided into ovate, obovate, or narrow segments, coarsely toothed or again divided, the terminal segments large and joined together, the lower ones smaller and distinct, sometimes with a loose woolly down, especially on the under-side. Flower-heads rather large, of a bright yellow, in a handsome, compact terminal corymb. Involucral bracts tipped with black, the outer ones few and very small. Florets of the ray from twelve to fifteen, linear-oblong, and spreading. The seed-like fruits of the disk are covered with short hairs, those of the ray with none. A native of Europe and Asia.

Having a perennial root-stock, the Ragwort is difficult to eradicate; care must be taken to remove the root-stock from the soil, otherwise the plant will grow again. Since it seeds freely, and the seeds are easily carried by the wind, it should be destroyed before flowering.

Proclaimed for the Shires of Phillip Island and Woolamai, Wooryal, Poowong and Jeetho, South Gippsland, Mirboo, and Colac.

PLATE 18

RACWORT

(*Senecio Jacobaea Linne*)

THE ORCHARD.

James Lang, Harcourt.

The season is proving exceptionally dry with severe hot winds which are rapidly drying up the moisture in the ground. It is many years since we experienced such a season as the present, and those growers who succeeded in getting their orchards ploughed early may congratulate themselves; by doing so they have been able to conserve the moisture in the subsoil for the benefit of the trees. If the present kind of weather continues throughout the summer fruit will not be of a satisfactory size, except where it is practicable to irrigate. Keep the surface of the ground loose by the use of the scarifier. Although the weeds do not grow, it does the ground good to run the harrow or scarifier over it now and again—it prevents caking and keeps the moisture from evaporating.

Spraying will take up a good deal of time this month. For the codlin moth make the early spraying as effective as possible and then there will be fewer moths to lay a second brood. The writer has received a number of letters during the past month inquiring if lime is used in making the arsenite of lead spray? No lime is used in this spray which should be made up according to the formula given in the October *Journal*. In many of the orchards growers are relying more upon effective spraying of the trees than upon bandaging. It is best, however, to bandage the trees. Bandages should be put on at once and examined every ten days and all grubs found destroyed. The examination of the bandages will also show whether the spraying has been effective.

The fruit crops generally will be much lighter than last year, early cherries especially. Plums, apricots, and peaches have suffered from the frost in some districts. Apples and pears will also be much lighter than last year. Perhaps it will be just as well as it will allow the fruit to swell to a more satisfactory size than if there was a heavy crop.

Examine all grafts and loosen the ties; also stake them so that they will not get blown off by the wind.

The time is approaching when the Fruit Fly if acclimatized will put in an appearance. Growers therefore should be on the alert and take all possible means to stamp it out before it spreads further. Kerosene placed in small tins on the trees is about the best remedy to adopt; fallen fruit should be at once picked up and destroyed. The Government Entomologist has had a number of suitable tins made and these can be obtained by any orchardist at cost price plus postage.

INSECT PESTS IN FOREIGN LANDS.

Progress Report by Mr. W. W. Froggatt, F.L.S.

[Mr. Froggatt, Government Entomologist of New South Wales, has been sent on a mission by the Governments of Queensland, New South Wales, South Australia, and Victoria to investigate the Fruit Fly and other insect pests and their natural enemies in Europe and America. The first of Mr. Froggatt's reports referring to his investigations in the Hawaiian Islands is appended.—EDITOR.]

16th August, 1907.

I have the honour to report that I left Honolulu on the 14th inst. after a stay of three weeks in the Hawaiian Islands and expect to reach San Francisco on the 21st. During the time spent in Hawaii I visited and worked on the three Experimental Stations—United States Experiment Station of the Federal Government, the Sugar Planters' Association Experiment Station, and that of the Bureau of Agriculture and Forestry (Territorial). I am greatly indebted to the officers of all these stations, but especially to Mr. Jared Smith, Director and Mr. Van Dine, Entomologist of the United States Experiment Station, who made arrangements for me to see all the most interesting points, Mr. Van Dine going with me to several districts.

I have had a very busy and very interesting time and studied under natural conditions the leading insect problems of the islands, several of which I will briefly note, and propose to later on give an extended report for publication in the Agricultural Journals or Special Bulletins. Acting on my instructions, I devoted a great deal of attention to the "Melon Fly" (*Dacus cucurbitæ*), closely allied to the Queensland Fruit Fly, a pest that is said to have been introduced from India, and which is now widely distributed and well established in all the islands of the group. It attacks all kinds of melons, cucumbers, string beans and tomatoes, but has never been found in other fruits. The melons are attacked just when they are formed, to the size of a hen's egg. The Japanese now cover each young fruit of the water melon up to this size with tissue paper, but rock melons are attacked up to maturity. In many districts melons are not grown and all melons are expensive. The destruction of infested fruit would probably check this pest, but there is no Vegetation Diseases Act in force in these islands, except on the import of fruit. I have forwarded specimens in all stages of development to Mr. Gurney, with other insect pests.

The question of parasites introduced by the Entomologist of the Sugar Planters' Association on the Lantana Scrub is a much more complicated business, and I travelled over a great deal of country to see for myself the actual conditions of the lantana and the insect pests that have been introduced from Mexico, America and India. It has been claimed that the lantana is entirely destroyed in some districts through these insect parasites, but, though there is no doubt under certain conditions its growth has been checked and great quantities of the flowers and seed buds destroyed, it is not dead and the bulk of it will have to be removed when clearing, by mechanical methods. Quite a number of different insects were propagated on latana; two moths, a leaf mining fly, a gall making fly, and a small leaf bug. The latter is one of the most effective, attacking the under-surface of the leaves and causing them to drop off. On the very dry shallow soil on hill tops the lantana is very sick. This bug, however, is very closely allied to our native olive bug, which destroys the foliage of the cultivated olive, and we could never allow it to be introduced

in Australia under any conditions. The pest, however, that in my opinion, after very close observation has done more damage and is still at work on the lantana is the "Maui Blight" (*Orthesia insignis*) one of the Mealy Bugs, known as a very destructive pest to the tea plant and other shrubs in India and the East. It must be stated, however, that the entomologist did not introduce this doubtful pest; it was accidentally introduced on the island of Maui, but has been widely spread all over the other islands by the ranch men, and is attacking other plants and may be a very grave plant pest to reckon with in the future. I therefore strongly advise that under no conditions should we introduce any of these insects into Australia to kill lantana; even if they killed every bush out, our conditions of plant life are so different that it is hard to say where the pest insects would stop after the original host plant died out.

The Hawaiian Islands are the adopted home of a great many cosmopolitan pests, and though many useful insects, among them Australian ladybird beetles, have from time to time been introduced, the injurious ones are very much in evidence. Among those most evident in the beautiful gardens that surround Honolulu are the two foliage pests, known as the "Japanese Leaf Beetle" (*Adoretus umbrosus*) and Fuller's Rose Beetle (*Aramigus fulleri*) the latter an American importation. If by any accident either of these beetles were ever introduced into Australia with plants from America, Honolulu, or Japan, which could very easily happen in soil round the roots of plants, the nurserymen and rose growers would have two very formidable pests to deal with.

At the request of the manager of the American Sugar Company, accompanied by Mr. Van Dine, I visited the Island of Mooliki and spent several days on their ranch to see the damage caused to their stock by a species of flesh fly allied to our sheep maggot flies, and also to study the habits of the "Horn Fly," which was introduced from America some years ago with stock and has spread all over the place. It is one of the worst blood-sucking flies, breeds in cattle manure, and covers the shoulders and sides of the cattle in thousands and infests horses but slightly, but does a great deal of damage to sheep, for scab is common on most of the ranches and wherever there is a sore or wound on the sheep these flies swarm and keep it from healing. Most of the old sheep have a raw sore up to 6 inches in diameter on some part of the body, the combined result of scab and horn fly, so that they have little chance to get fat or grow wool. This also is a pest that we should be on the watch for in Australia, as it is evident by its introduction into Hawaii that it could be brought into Australia, and a native of Texas would soon flourish in similar climate and conditions. I also found "Horn Fly" abundant in all dairies visited about the town.

The great industry of the islands is, as you are aware, sugar planting, which produced 137,750 tons of sugar last year. The Economic Entomologists working at the Sugar Planters' Experiment Station therefore confine their attention to the sugar cane pests in which the planters are particularly interested, and have carried out many interesting experiments in checking injurious insects that have damaged the sugar cane crops. Some years ago a small leaf hopper (*Perkinsella saccharicida*) made its appearance as a pest in the cane fields, and about 1902 swarmed in such numbers—sucking up the sap and depositing their eggs both in the leaf stalks and the cane stems—that the whole fields were black with fumagine, and through the injuries they caused rust and fungi damaged the tissues of the stalks. These injuries caused a great loss in the yield of juice, and Messrs. Perkins and Koebele came to Australia (whence much cane had been introduced

into Hawaii) to see if they could find the home of the pest, and its parasites if any. In the middle of 1904 they found this pest common in the North Queensland Plantations, and also discovered a small hymenopterous parasite destroying its eggs. The infested eggs were sent in cane stems to Honolulu, and the parasite is now so well established that the leaf hopper is kept in check. Still there is a good number of the destructive leaf hoppers to be found, and it will be interesting to watch later developments. It seems incredible that the parasites have mastered the hoppers in such a short space of time as two years, and spread to all the sugar cane, however carefully they have been spread by the entomologists of the Sugar Planters' Association. There can be no question about the value of this parasite and another since introduced from Fiji, but there may be also other agencies at work in checking leaf hoppers, one of which is the return of some of the companies to the old method of cleaning up the cane fields by burning up all rubbish. Harder stemmed varieties of cane are also not so subject to the attacks of leaf hoppers in the stem.

At the present time there is an agent of the Sugar Planters' Association in India and Java looking for a parasite for the cane weevil (*Sphenoporus obscurus*) introduced from Tahiti in banana stems over 40 years ago. This beetle burrows in the stems of the adult cane in the larval state, causing it to decay, and does a great deal of damage where numerous; it is probably the worst of the sugar cane pests at present. Another important industry in the islands is pine apple culture, and over 3,000 acres of pine apples are now grown at Wahiawa, about 25 miles from Honolulu at an elevation of about 1,000 feet. The output from the three large canneries for this year is estimated at 500,000 cases of canned pineapples, each case containing two dozen tins of about 2 lbs. to the tin. All the work on the plantations is done by Japanese. The insect pests of pineapples are a mealy bug (*Pseudococcus citri*) and a leaf scale (*Diaspis bromeliæ*). The most serious damage to the pineapple is caused by a ripe rot (*Thielaviopsis ethaceticus* Went.) which starts at the base and spreads upwards.

The export of honey to the United States from the Hawaiian Islands is another important industry, and all the ranches run apiaries; almost all the honey is obtained from the flowers of the Algeroba trees (*Prosopis juliflora*)—introduced from Mexico and forming extensive thickets along all the coast lands. When the Pure Food Act came into force last year in the United States, it was discovered that the Hawaiian honey would not pass the test of pure honey, as it was also collected by the bees from the honey dew exuded by the froghoppers in the cane fields and therefore contained water. This very sweet white honey is largely used by the pastry-cooks in California to make biscuits and cakes, and though at first it was suggested to get over the difficulty by calling it "honey-dew honey" the bee-keepers objected so strongly that a compromise was effected by calling it "white honey" under which name it is allowed into the States. The question that the bees collect honey-dew from insects that eject this fluid has not, as far as I am aware, ever been raised in Australia, but in some districts where flowers are scarce, and such insects of psyllids, aphis, and froghoppers are abundant, bees might acquire the same habit in Australia. One of the questions among the bee-keepers in the Islands is the planting of flowering shrubs and trees that will secrete nectar. Those that will also grow into timber are much in favour, for with the exception of the algeroba, there are no trees upon the Islands that will supply firewood. It is, however, interesting to find that Australian Eucalypts, Wattles, and Sheoaks, such as *Eucalyptus globulus*, *E. robusta*,

Acacia decurrens, and the *Casuarinas* have been planted in considerable number at the ranches, the last-named in many of the parks and gardens, where they are called "ironwoods."

From all the reports I had read I had expected to find no scale or mealy bugs about the parks and gardens, but this is not the case, for though great numbers of Australian and other country ladybird beetles (*Coccinellidæ*) have been introduced into the Hawaiian Islands there are plenty of scale insects upon many different trees and shrubs. In the parks *Icerya purchasi* is common on the ironwoods (*Casuarinas*)—trees it never infests in Australia. Though there is a very strict import Act in force in Honolulu as regards the introduction of insect and fungus pests, there is no internal Act whereby the local gardens and farms can be dealt with; therefore there is no inspection of pests beyond the port of entry. Another factor in the spread and increase of introduced insects is the absence of all insectivorous birds. The only birds one ever sees are the common sparrow, Indian minah, and the Rice bird, all introduced and all more or less destructive—at times.

The introduction of the Yellow Fever mosquito into Hawaii and the abundance of the common cosmopolitan species in the stagnant water about the town of Honolulu has led to a great deal of interest being taken in the control of these insect pests. Under the able supervision of Mr. D. L. Van Dine a mosquito crusade was taken up in 1902 to find out their breeding places, and oil or fill up all stagnant pools. In this survey of Honolulu and vicinity it was found that in the business part of the town that the mosquitoes were bred in immense numbers in old cans, tubs, broken crockery, and such like receptacles. Prison labour was obtained, all such things were gathered up and taken out to sea and thrown overboard, and instructions issued to householders to look after the water about the yards. In 1904 the Citizens' Mosquito Campaign Committee arranged to introduce "Top minnows" (*Mollienesi latipinna*) handy little fish common in the shallow waters of Mexico and Texas which feed upon the mosquito larvæ and eggs. Late in the following year these fish reached Honolulu and were liberated in several ponds at Monalua, where they have since increased in immense numbers, and can live in just such shallow warm water that mosquitoes frequent, and there is no question that in the districts where these little fish have been introduced the mosquito pest has been greatly abated. It is now proposed to appoint an officer under the Board of Health as Mosquito Inspector. The question of stocking all our waterholes with small fish of this or other kinds is worthy of consideration by our Fisheries Department, as the mosquito pest could be much more easily dealt with in most parts of Australia than in Hawaii.

THE ELEMENTS OF ANIMAL PHYSIOLOGY.

W. A. Osborne, M.B., D.Sc., Professor of Physiology and Histology, Dean of the Faculty of Agriculture in the University of Melbourne.

(*Continued from page 591.*)

CHAPTER X.

Digestion and Absorption.

The alimentary canal can be regarded simply as a tube which passes through the animal from mouth to anus. As the length of this tube is

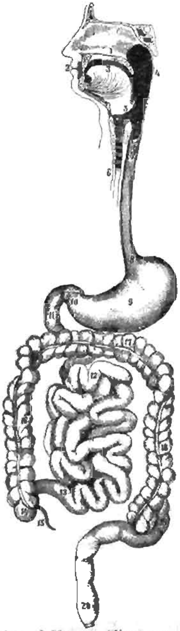


Fig. 42. Abdominal Portion of Human Alimentary Canal. (After Ellenberger.) 8. Termination of œsophagus. 9. Fundus. 10. Pylorus. 11. Duodenum. 12 to 13. Small intestine. 14. Cæcum. 15. Vermiform Appendix. 16, 17, 18, and 19. Colon. 20. Rectum.

always greater than the length of the animal, it follows that the tube in some part of its course is coiled. The length, relative and absolute

of the alimentary canal varies with each species of animal. We find for instance that the ratio

		Cat.	Dog.	Horse.	Pig.	Ox.	Sheep and Goat.
length of alimentary canal / length of animal	equals approximately	$\frac{1}{4}$	$\frac{1}{5}$	$\frac{1}{12}$	$\frac{1}{16}$	$\frac{1}{20}$	$\frac{1}{26}$

GENERAL ANATOMY.—In the course of the alimentary tube we find some dilatations and constrictions, which mark it off into special parts and to which distinctive names have been given. At the beginning of the canal we find the MOUTH; this opens into a short and muscular part common to the digestive and respiratory systems, called the PHARYNX; then comes a straight narrow portion called the gullet or ŒSOPHAGUS. The lower part of the œsophagus is in some animals dilated forming an organ which is termed the crop or PROVENTRICULUS. This opens into the true STOMACH which consists of two parts, the FUNDUS and the PYLORUS.

At this point the alimentary canal becomes a thin and very convoluted tube called the SMALL INTESTINE: the first part of the small intestine which always forms a very distinct loop is called the DUODENUM. The small intestine opens into a dilated pouch called the CÆCUM which in some animals takes the form of a long blind tube. The next part of the alimentary canal commencing at the cæcum is the LARGE INTESTINE or COLON: this merges into the RECTUM which ends in the ANUS.

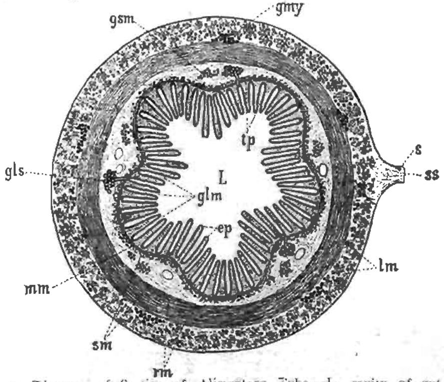


Fig. 43. Diagram of Section of Alimentary Tube.—L., cavity of gut; glm., glands of mucous membrane; ep., epithelium; gls., glands in sub-mucous coat; mm., muscularis mucosæ; sm., submucous coat; rm., circular muscular coat; lm., longitudinal muscular coat; s., serous or peritoneal coat; ss., mesentery; gmy. and gsm., nerve ganglia. (After Sobotta.)

GENERAL HISTOLOGY.—The wall of the alimentary tube consists of several layers. Most central is the lining mucous membrane which extends from lips to anus. The character of this mucous membrane

varies in different parts. In the mouth, pharynx, œsophagus and crop it is of the character known as stratified epithelium and functions as a protective membrane only; in the true stomach, cæcum, colon and rectum the epithelium is columnar and is depressed into simple tubular glands (Fig. 45); in the small intestine there are not only these small depressions but between them are elevations or VILLI which markedly increase the surface. Immediately external to the epithelium is a delicate band of smooth muscle called the MUSCULARIS MUCOSÆ which by its contraction can pucker the epithelial layer. External to this is a layer of loose connective tissue called the SUBMUCOUS COAT which allows the epithelial layer some freedom in altering its shape and which generally contains a few mucous glands. The latter secrete a glairy tenacious fluid, *mucous*, consisting chiefly of water, mucin and salts, which is poured on the surface of the epithelium and which acts as a lubricant as well as a protection to the exposed cells. The next layer is a strong band of smooth muscle disposed circularly, whilst external to this is another strong band of smooth muscle disposed longitudinally. In those parts of the tube that lie in the abdominal cavity (crop to beginning of rectum) we have another coat external to this longitudinal muscle called the serous or PERITONEAL COAT which is really a sheet of fibrous tissue thrown round the tube but not completely enclosing it, and continuous with the same sheet lining the inner wall of the abdominal cavity. Thus the tube is slung in the abdominal cavity by a double layer of fibrous tissue, called the MESENTERY, in which run the vessels and nerves supplying the various coats of the tube. The peritoneal or serous coat on its exposed surface is very smooth and is constantly moist, so that the various organs can move about without friction.

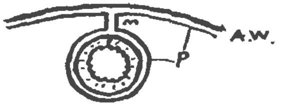


Fig. 44. Diagram to show arrangement of mesentery. A.W., abdominal wall; P., peritoneal coat lining abdominal wall and reflected over gut; M., mesentery.

The structure of the villi deserves some special mention. These projections, which give a velvety appearance to the mucous membrane of the small intestine, are lined, as has been stated, with columnar epithelium; within this is found a layer of blood vessels; within this a thin band of smooth muscle; whilst most centrally is placed a small vessel ending in a knob which vessel belongs to the lymphatic system (to be discussed later) and is called a LACTEAL.

THE GLANDS OF THE ALIMENTARY CANAL.—The mucous membrane of the mouth, pharynx, œsophagus and crop is kept lubricated by small mucous glands in the sub-mucous layer. In the mouth however are found the openings of the ducts of special masses of glandular tissue called the SALIVARY GLANDS. The secretion of these glands is called *saliva* or spittle. In the stomach the tubular glands, described above, secrete *gastric juice*. In the intestines the secretion of the tubular glands is called *succus entericus*. The tubular glands of the colon secrete a large amount of mucus as well as succus entericus.

Opening into the duodenum, or first part of the small intestine, are the ducts of the two largest glands of the body, the LIVER and the

PANCREAS. The duct of the liver has, in most animals (not in the solipeds however), a pear-shaped dilatation called the GALL BLADDER. The secretion of the liver is called *bile*. The pancreas or sweetbread is, in part, firmly attached to the duodenum; its secretion is called *pancreatic juice*.

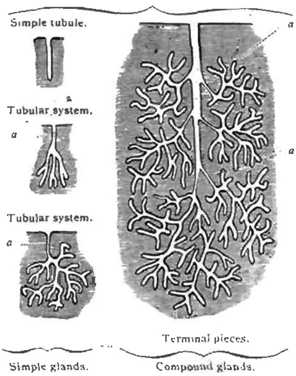


Fig. 45. Simple and compound tubular glands. (After Stöhr.)

ADENOID TISSUE OF THE ALIMENTARY CANAL.—We have seen in a former chapter that adenoid tissue is composed of densely packed cells supported on a connective tissue frame-work. The alimentary canal is fairly rich in this tissue. At the junction of the mouth and pharynx are found two masses of adenoid tissue, one on either side, called the TONSILS. In the mucous membrane of the pharynx many adenoid nodules are found. In the œsophagus, crop and stomach adenoid tissue is present in but small amounts. But in the small intestine we find large nodules of it interrupting the mucous membrane and called PEYER'S PATCHES. The cæcum is also rich in this tissue which in some animals forms a definite outgrowth called the VERMIFORM APPENDIX. Close to the stomach but independent of the alimentary tube, is an organ composed wholly of adenoid tissue and well supplied with blood vessels, called the SPLEEN. Of the functions of these adenoid organs we know nothing.

MOVEMENTS OF THE ALIMENTARY CANAL.—Only in the mouth and pharynx, and in the œsophagus in varying degrees in different animals, and around the anus do we find striped muscle which is under the control of the will. In all other regions of the canal the muscle is smooth and involuntary. The typical movement which the alimentary wall can carry out is a worm-like motion by which the contents of the canal are urged in the direction of the anus. The circular coat of muscle contracts immediately headward of the food mass, and the constriction thus formed is capable of passing like a wave for a short distance down the tube.

At the same time the longitudinal coat helps by contracting, so that the gut wall is pulled over the food-mass. This worm-like action is called *peristalsis*. Peristalsis is rapid in the œsophagus but slow in other regions of the canal. In the œsophagus and in the first part of the colon of most mammals peristalsis can also take place in the reverse direction, namely, towards the mouth.

Another movement that is found in many parts of the canal is a peristalsis of a very weak character, the constriction of the tube being never complete. This movement does not urge the entire food mass onwards; it seems rather to drive forward the most outward layer of the food and to bring a fresh surface in contact with the mucous membrane.

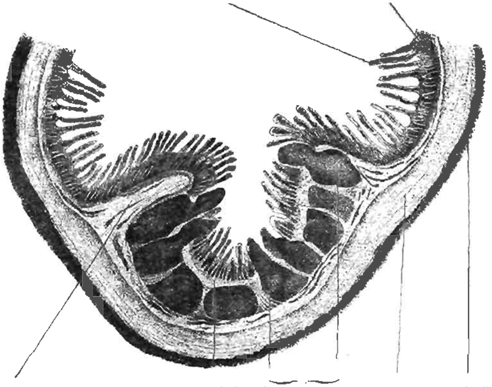


Fig. 46. Transverse section of a patch of Peyer of the small intestine of a cat. The crests of four nodules were not within the plane of the section. (After Stöhr.)

Dilated parts of the canal like the crop, cæcum, colon and fundus of stomach do not show a true peristalsis. On their walls faint waves of muscular contraction may be seen which produce surface currents in the food-mass or rotate the whole. These organs are also capable of strong contraction involving the whole wall so that the contents can be squeezed out.

When a thin part of the canal opens into or out of a dilated part we generally find a strong ring of circularly disposed smooth muscle, really an enlargement of the ordinary circular layer, which maintains a continued contraction and keeps the entrance or exit of the dilated part closed. This muscular ring only relaxes when it is necessary for a food-mass to be driven through and when this is over the ring closes up tightly again. Such rings of muscle are called SPHINCTERS. The

external sphincter of the anus is remarkable in that its muscle is striped or voluntary.

The acts of prehension and mastication (chewing) of food are under the will, and are carried out by slightly different methods in different species. The act of swallowing is usually divided into three stages. In the first, which is voluntary, the food, after mastication, is passed to the back of the mouth and into the pharynx. Once the food is in the pharynx the second stage takes place reflexly and independent of the will. A strong peristalsis of the pharynx occurs and the root of the tongue is jerked against the retreating bolus of food. At the same time the hinder openings of the nostrils are closed by the soft palate, and the entrance to the wind-pipe is closed by this being drawn forward under the tongue. By the vigorous muscular action of the pharynx and of the tongue the food is shot into the œsophagus where the third stage takes place. In this the food is carried towards the stomach or crop by a quick and involuntary peristalsis and as the food arrives at the termination of the gullet the sphincter guarding the entrance to the stomach or crop relaxes, lets the food pass, and then closes again. The muscular character of peristalsis explains why most animals are able to eat and drink with their heads lower than their stomachs.

Vomiting can take place readily in carnivores and omnivores but in solipeds it is of very rare occurrence and is almost unknown in ruminants. When a man vomits a deep breath of air is taken and the escape of the air prevented by closure of the glottis. Then the abdominal and thoracic muscles contract vigorously—an action which, if the glottis were not closed, would only drive air out of the lung, but owing to the closure of the glottis the pressure is borne by the abdominal organs. The muscles of the stomach contract too and the sphincter between the œsophagus and the stomach is relaxed. The pressure on the stomach contents forces them along the œsophagus and so into the mouth (nostril of the horse). Vomiting is a reflex generally started by the presence of irritating matter in the stomach, though it may also be due to nervous diseases and disturbances.

Defæcation is the act of extrusion of fæces through the anus. When the fæcal mass accumulates in the lower colon it excites reflexly a strong peristalsis by which it is carried through the rectum. The anal sphincter then relaxes and a strong contraction of the rectum drives the fæcal mass outwards. This action is generally helped by the abdominal muscles contracting and exercising a pressure as in vomiting. Rumination will be discussed under digestion in the stomach.

BLOOD SUPPLY OF THE ALIMENTARY CANAL.—All parts of the alimentary tube are richly supplied with blood vessels that bring red, arterial blood from the aorta. A remarkable peculiarity is present in the parts of the tube that lie in the abdominal region. The blood which has traversed these portions, together with that from the pancreas and spleen, instead of passing into veins that flow direct to the heart, is collected by a system of veins which join into one great vein called the PORTAL VEIN. This portal vein runs towards the liver and breaks up into myriads of branches in that organ so that the blood is brought into the sphere of action of the liver cells. Then from the liver it passes by the ordinary route of the veins to the heart. Thus all the blood drained from the abdominal digestive organs and from the spleen must pass through the liver before it can reach the general circulation. The great importance of this we shall see later.

The lymphatic vessels or lacteals placed centrally in the villi communicate with a smaller number of larger lymphatic vessels and these pour their contents into the largest lymphatic vessel of the body, the THORACIC DUCT, which passes up close to the spine and empties into a vein near the heart.

There are therefore two paths by which a substance, absorbed from the gut, may get into the general circulation; namely by the blood vessels of the gut, in which case it must run the gauntlet of the liver; or by the lymphatics, in which case the absorbed substance can enter the general circulation without passing through the liver, but its progress is much slower owing to the sluggish stream in the lymphatics.

NERVES OF THE ALIMENTARY CANAL.—In the intestines, and to a lesser degree in the crop and stomach, we find a local nervous system which reminds one of that present in the lowest invertebrate animals. It consists of a plexus or nerve-network with ganglia, in between the muscle layers and in the submucous coat. This system can work independently of the central nervous system and can carry out the peristaltic and rippling movements of the walls of the canal. Under normal conditions, however, it does not work independently, but is under the direct subordination of the central nervous system through autonomic nerves. In the first place the thoracic autonomic or sympathetic system sends nerves to the canal from œsophagus to rectum which can exert two functions, they can tighten up or constrict the small arteries in this region, and secondly, can slow down or stop the various movements of the canal muscles. On the other hand we have the cranial autonomic system, through the vagus nerve, innervating the pharynx, œsophagus and all the abdominal portions except the lower colon and rectum. Impulses passing down the vagus increase the muscular movements of the canal and can bring about forceful contraction of the entire musculature of the stomach; they can also start and increase secretion in the glands of the stomach. In the lower colon and rectum the vagus is replaced by sacral autonomics passing out of the spinal chord by the second and third sacral nerves.

The alimentary canal is also supplied with afferent or sensory nerves, giving in the mouth sensations of touch, taste, heat and cold and pain, but, in the main portion of the canal, pain is the only sensation obtainable except the special sensation of thirst and probably of hunger.

The salivary glands in the mouth region have each a double nerve supply, sympathetic and cranial autonomic; the former have fibres which constrict the blood vessels thus lowering the blood flow whilst the latter have fibres which dilate the blood vessels thus increasing the blood flow. Each has fibres acting on the gland cells but their distribution has not been worked out with sufficient clearness. It is known however that certain nerve impulses can influence the composition of the saliva fitting it for the particular substance in the mouth which has reflexly excited its flow.

The nerve centres which regulate the movements of the alimentary canal are all in the medulla oblongata, with the exception of that regulating defæcation which is in the lower part of the spinal cord. They are excitable by appropriate afferent impulses due generally to the food itself; thus food in the mouth starts afferent impulses which excite the centres for the salivary glands and for the secretion of gastric juice; food in the pharynx excites the centre for swallowing; fæces in the

rectum excites the centre for defæcation. But the centres are excitable by other afferent nerves and by impulses coming down from the brain. Thus, increased intestinal peristalsis may be caused by fright, and vomiting in the human being may be due to many factors other than those connected with digestion.

Voluntary control is possessed by the animal over the first stage of swallowing and over the relaxation of the *sphincter ani* but all the other nerve mechanisms are independent of the will and are effected by the autonomic system.

THE FUNCTIONS OF THE ALIMENTARY CANAL.—The first important function of the alimentary canal is the digestion of certain ingredients of the food by rendering them soluble, and soluble in such a form that they can pass into the columnar epithelium of the mucous membrane and so be absorbed. The second important function is the absorption of the digested food. These are the fundamental functions but they do not exhaust the list. Thus the lower part of the alimentary canal in all animals has excretory powers, *i.e.*, it gets rid, to some extent, of waste matter or foreign materials from the blood. Further, in many animals, we find some part of the canal functioning as a reservoir of water which can tide the animal over long marches between one drinking place and another.

DIGESTION IN THE MOUTH.—The shape and arrangement of the teeth vary in different animals according to the food they are fitted to eat and their manner of eating. The differences in the method of chewing and mastication are fairly obvious and need not be described here. In all mammals the tongue is a muscular organ covered with a rough and thick layer of stratified epithelium: it is richly supplied with end-organs for touch, and at its back has special end-organs for taste.

The saliva is the mixed secretion of a number (generally three pairs) of salivary glands. Its composition varies according to the composition of the substance in the mouth which has excited the flow. Thus sand or an irritating chemical in the mouth excites a flow of very watery saliva suitable for washing the substance away; water excites the flow of a very thick saliva rich in mucin, whereby the water is rendered semi-gelatinous—generally speaking the saliva excited is the best for that particular substance which enters the mouth. Saliva keeps the mouth moist, and by wetting the food can help the teeth and tongue to grind or roll the food into a mass fit for swallowing. In the saliva of omnivores and herbivores, especially when these are eating foods containing starch, the saliva contains an enzyme *diastase* or *ptyalin* which can convert the starch into the sugar maltose. The main ingredients of saliva are water, over 99 per cent., mucin to make the saliva adhesive and viscid, salts, and particularly lime salts, so that the saliva shall not absorb away the lime of the teeth (in fact lime salts are often deposited on the teeth as tartar) and diastase as mentioned. In saliva are also found some round white cells or salivary corpuscles, the function of which is not known. The functions of the mouth as regards digestion are therefore the prehension of food; the mastication of food, by which the surface of the food is increased and the food made into masses fit for swallowing; the selection of food by taste; and the mixing of the food with saliva.

No absorption of food occurs in the mouth.

(*To be continued.*)

FIRST PROGRESS REPORT ON VITICULTURE IN EUROPE.

F. de Castella.

I reached Marseilles on 22nd July, and on the following day proceeded to Montpellier, in the neighbourhood of which town I spent over a fortnight visiting vineyards, nurseries, collections of vines, and experimental plots. From Montpellier I proceeded *viâ* the valley of the Rhone to Switzerland where I arrived on 22nd inst., after breaking my journey at various points of viticultural interest, and also visiting Aubenas and Vallons on the Ardeche, and Vaucluse on the Sorgue, which I reached by branch lines from the Rhone. The main centres I called at on the Rhone were Avignon, Montelimar, Tain, Valence, and St. Vallier; in the neighbourhood of each of these towns I made numerous excursions.

Montpellier and its neighbourhood presents a vast field for the study of modern viticulture and more especially of reconstitution on resistant stocks. Its vinegrowers were among the first to recognise in the use of the American vine the true solution of the Phylloxera problem. The question was studied in the most thorough manner possible both by private growers and by Government institutions, chiefly the National School of Agriculture of Montpellier, which is now everywhere looked upon as the final Court of Appeal in matters viticultural. The influence of this celebrated institution is everywhere evident in the neighbourhood—the enlightened vineyard proprietors of the region eagerly co-operated, assisting by every means in their power, but chiefly by the establishment of experimental plots on such a scale that the whole country practically became one vast experimental field. The results obtained, carefully compared and studied by the leading viticultural authorities of France, have placed matters on such a footing that growers in the district are now able to plant with certainty of satisfactory results.

The question of the use of American stocks is most complex and its study in different centres often presents strange contradictions—it is only by experimental work in each locality, extending over a series of years, that the true value of each stock, for any given locality, can be accurately determined. It is the thorough manner in which this experimental work has been carried out that has made Montpellier the centre to which all countries now turn for the latest viticultural information. This result has not been achieved without frequent failures. Thousands of acres have been replanted several times over; the stocks first used proving unsatisfactory, they were replaced by others on which brighter hopes were founded. Reconstitution has been an established fact for nearly 30 years. Of the stocks first used, the vast majority (which are unknown in Australia) are now obsolete.

Until recently, the vine was by far the most profitable culture in this part of France. From Cette, on the West of Montpellier, to Lunel, on the East, the whole country is one vast vineyard; every available acre, except a few stony outcrops, being under vines. Seen from the train, even at this dry time of the year, it presents the appearance of a sea of green, only interrupted by an occasional village, the roads, dusty and white in the strong sunlight, and the cellars, farm buildings and dwelling houses of large estates, numerous in these parts.

Aubenas is chiefly interesting as the home of M. Couderc well known as the raiser of several of the best grafting stocks such as Nos. 3306,

3309, 1202, &c. I spent three days with M. Couderc, whose long practical experience and scientific attainments give great weight to his opinions. In addition to experimental plots and collections, he owns vineyards and makes wine on a commercial scale. He is an indefatigable raiser of new varieties and hybrids, and has raised no less than 300,000 seedlings, some of which have proved of very great value. At Vaucluse I visited M. Tacussel, a large grower of wine and table grapes, whose magnificient collection of the latter comprises 800 varieties. M. Tacussel is a large shipper of table grapes, especially to England and Germany; he also makes annually some 20,000 gallons of wine. Many of the varieties he cultivates largely are new to Australia; several would be distinct acquisitions, and should, I think, be introduced into Victoria.

On the Rhone, I visited many vineyards, breaking my journey at the places already mentioned. The Rhone valley is interesting to an Australian for several reasons. Its soils, like those in many parts of Victoria, are poor in lime. The question of adaptation in calcareous soils, so important near Montpellier, is no longer a vital one here. The chief variety cultivated is the Syrah which is identical with our Red Hermitage or Shiraz, so largely cultivated in Victoria, and which forms the basis of our export wines. The Marsanne, the leading white variety, is the same as our White Hermitage. The wines produced are more similar to our best Australian than those of Southern France. The celebrated Hermitage, Cornas, St. Peray, Condrieux, &c., both red and white, are of fuller body and higher alcoholic strength than most French wines and remind one of our best Victorian.

Before proceeding further I must place on record the very cordial manner in which I have been received by those with whom the work of my mission has brought me in contact, without a single exception. No thought of commercial rivalry or competition has ever prevented those whom I have had the good fortune to meet, officially or privately, from doing their utmost to aid me in every way in their power. I have been fortunate in the way of letters of introduction, through my father and other friends, but the generous aid I have received has exceeded my most sanguine anticipations and greatly facilitated my work.

With regard to the late "Viticultural Crisis" it will reassure our growers to learn that it is chiefly the cheap "Vins ordinaires" which have suffered. The glut in these wines has had a depressing effect on the market generally, but the choicer French wines are still selling at payable prices.

Phylloxera.

Except in a few out of the way places, phylloxera is now seldom heard of in France. It is, of course, always there, but with practically the whole country reconstituted it is powerless to injure any but vines grafted on stocks which are not sufficiently resistant. I have seen some vineyards where phylloxera has been combated by other means than grafting, viz., plantation in sand, by submersion, and by the cultivation of direct producers. In isolated cases one or other of these may be of use with us. I have collected full information. But the true solution of the phylloxera problem is now and probably always will be grafting on resistant stocks.

Grafting on Resistant Stocks.

The only points discussed now-a-days, are in connexion with the choice of stock, in view of conditions of soil, climate, and scion. Resistance to phylloxera is the first and most vital requirement. Many of the early stocks were wanting in this, and if not killed outright, they suffered from the insect, at least when grafted, to such an extent as to render their use

unprofitable in all but a few soils unsuitable for the life of phylloxera. These stocks are now obsolete. Opinions concerning adaptation and affinity and the influence of the stock on the quality of the wine, differ greatly. The advice given in one district is sometimes quite the reverse of that to be obtained in another. This renders the greatest caution necessary. The following notes on the chief stocks we use in Victoria, and some others, may prove of interest.

RIPARIA.—This was the first pure American species used in France on a large scale. Selections were made from the wild vines shipped from the State of Missouri, U.S.A., among which Riparia Portalis or Gloire, as it is now more generally called, soon proved its superiority. It is the only Riparia now used in France on a commercial scale. Though I have not been able to learn anything very serious to the detriment of Riparia Grand Glabre, except that it is generally held inferior to Gloire, there does not seem to be much inducement for us to continue its propagation in Australia, since it has been abandoned in France. Riparia Gloire, in common with Riparias generally, combines good qualities with some serious defects. It knits its grafts well and cuttings strike readily. Vines grafted on it commence to bear early and are remarkable for the regularity and abundance of their yield. The time of ripening of the fruit is also hastened. The defects are serious. As its name denotes it requires a free, rich, deep and well drained soil—what is known in France as Riparia soil. Planted in soils which do not suit it, it makes but little growth and bears poor crops. It is a short-lived variety and even in suitable soil, after a few years, it loses vigour and ceases to give profitable results. I have seen blocks which through excessive production had become almost sterile at as early an age as seven years. In some cases vigour has been restored by exceedingly short pruning for a year or so. Large areas of Riparia on unsuitable soil have been and are now being uprooted annually and replaced by vines on more suitable stocks.

Even in suitable soil, a vineyard proprietor considers 20 to 25 years to be the life of a vineyard grafted on Riparia. In our dry Australian climate it will be well to employ Riparia with caution. Vines grafted on it must not be pruned too long or they will rapidly exhaust themselves. In the majority of cases, as is now generally being done in France, it will be better to select other stocks in its place even in Riparia soils.* In these the hybrids 3306 and 101[14] give equally satisfactory results combined with greater durability. They seem to retain, in a high degree, the precious qualities of the Riparia parent without its most serious defects. A few years ago Riparia was employed in France far more extensively than any other stock; now-a-days, though still largely used, its popularity is distinctly declining.

RUPESTRIS.—Of the numerous Rupestris at first selected and extensively propagated, only one is now used on a large scale in France. This is the Rupestris du Lot or Rupestris Monticola, by which name, as well as several others, it is also known. The other Rupestris, such as R. Ganzin, R. Martin, R. Metallica, &c., are now looked upon as obsolete. I cannot hear of any definite charge being brought against them, but am assured on almost all sides, that they have been found inferior and discarded. I shall therefore confine my remarks to R. du Lot.

This stock has recently given rise to more discussion than perhaps any other, and even now it is impossible to accurately judge its true value. Owing to its extraordinary vigour it has many friends and has been planted very extensively. Some growers who have cultivated it for years prefer it to all other stocks and use it for new plantations, and for replacing

*[NOTE.—Riparia stocks are only used at Rutherglen Viticultural Station in the case of vines specially ordered for planting in deep alluvial soils.—ED.]

faulty or dying vines in their vineyards. Others give it a bad name, saying that it fears drought more than Riparia, and that it is much given to set badly the fruit of vines grafted on it. Some again, amongst whom I may mention no less an authority than M. Couderc, question its resistance to phylloxera. I have seen cases of vines affected in his vineyards near Aubenas.

In the Montpellier district this stock is very highly thought of and largely used. In the majority of cases it is preferred to other stocks in all soils, except those which are too moist, or which contain an excess of lime. Soils containing more than 25 per cent. of carbonate of lime are not suitable for this stock. I have seen R. du Lot grafted with many different scions, both in the vineyards on a very large scale, and in single rows in experimental plots, alongside of rows on other stocks. In soils which suit it, at least near Montpellier, it has always been able to hold its own. The vigour of its grafts is very fine and their fructification very satisfactory, though, as a rule, somewhat less than that of vines on Riparia stock in their prime. As regards durability it far surpasses Riparia. Though a later importation than the last named stock, it has now being used on a large scale for a sufficient number of years to abundantly prove its value in localities for which it is suited. Near Montpellier I have not been able to find a case of insufficient resistance to phylloxera on R. du Lot.

It is, as has been said, a very vigorous stock—excess of vigour is sometimes for imperfect setting of the fruit. This is one of the chief faults found with Rupestris stock. If grafted with varieties liable to set badly, the crop is usually light, especially when the vines are young—long pruning remedies this to some extent, but as a rule it is an unsatisfactory stock for shy bearing sorts. This tendency is very evident in experimental plots where rows of different stocks grafted with the same scion are to be seen growing side by side. Take for example, Aramon on Rupestris and on Riparia. The bunches of the former are distinctly looser and more scattered than those of the latter. With such a heavy bearer as Aramon this is of little importance, the big loose bunches borne on Rupestris yielding as much wine per vine as the more compact ones on Riparia. But with less prolific "cepages" this pecularity must not be lost sight of; also in the case of table grapes, many of which set their fruit badly. On the other hand, certain table grapes with too compact a bunch may be improved by this tendency to scattered berries. Vines grafted on R. du Lot ripen their fruit usually a week later than the same kind on Riparia. This point should be taken into consideration when selecting stocks for table grapes.

From what I have seen near Montpellier I am convinced that in this particular locality, and grafted with the heavy bearing cepages of the region, Rupestris du Lot gives absolutely satisfactory results in the vast majority of cases. The soil about here is deep and usually gravelly or stony and easily penetrable by the roots of the vine. Where the sub-soil is clayey or otherwise impenetrable results are less satisfactory. Though growth may be sufficient, vines grafted on this stock are apt to lose the leaves near the base of the canes prematurely, thus exposing the grapes to sunburn. In such cases R. du Lot may suffer from the drought even as much as Riparia.

At Vaucluse R. du Lot is almost as popular as near Montpellier. M. Tacussel uses it as a stock for table grapes, especially for such kinds as are too close in the bunch. At Aubenas and at Vallons this stock is held in less esteem; at the latter place, it is said to suffer from drought even more than Riparia. The case of insufficient resistance to phylloxera at Aubenas has already been referred to. It occurred in a block of mother vines grown for the production of grafting wood—several depressions were noticeable.

On the Rhone, at the Hermitage, St. Peray, Cornas, &c., this stock is also unpopular. Syrah (our Shiraz or Red Hermitage) grafted on it takes too long to come to full bearing, and often suffers from the partial non-setting of its fruit, known in French as Millerandage. Here again I was informed that Rupestris suffered from drought more than Riparia. On the Rhone, Hybrid No. 3309 is found to be the best stock for Syrah. All new vines planted are grafted on it. R. du Lot is rather susceptible to Pourridie or root rot in soils liable to this disease.

From the above it is evident that R. du Lot is a stock which should not be too extensively planted without careful consideration. Growers must avoid being led away by its remarkable vigour (as happened frequently in France) to preferring it to other stocks which, in certain soils at least, will give better results. In soils which suit it, such as the deep soils of Montpellier, and for suitable scions, it can confidently be recommended as one of the most vigorous, most durable and generally satisfactory stocks.

It will be most interesting to see in what esteem this stock is held in Spain, Portugal, and Algeria. It will be noted from what has already been said that in the warmer Southern part of France it is more popular than in the cooler central positions.

(To be continued).

SCALE OF CHARGES, GOVERNMENT COOL STORES, MELBOURNE.

Produce.	Treatment, &c.	Rate.	Storage.*
Butter or Milk ..	Per box, for first two weeks, or any portion thereof, including handling, freezing, and shipping	3d.	1½d.
Butter	Per cask, for first two weeks, or any portion thereof, including handling, freezing, and shipment	6d.	3d.
Cheese	Per case of 1 cwt., for first two weeks, or any portion thereof	6d.	3d.
Ditto	For ripening, per large cheese, first week	1½d.	0½d.
Ditto	For ripening, per loaf cheese, first week ..	0½d.	0¼d.
Eggs	Per case of 25 dozen, for first two weeks, or any portion thereof	4d.	2d.
Ditto	Per case of 36 dozen, for first two weeks, or any portion thereof	6d.	3d.
Ditto	Per dozen for export, including grading, packing, case, and 14 days' storage ..	1½d.	1½d.
Poultry — Chickens, Fowls, Ducks	Per pair for export, including grading, killing, dressing, packing, case, and 21 days' storage	8d.	1½d.
Geese and Turkeys	Per pair for export, including grading, killing, dressing, packing, case, and 21 days' storage	1s.	1½d.
Game	Per pair (12 to 24 pairs to case), including grading, killing, dressing, packing, case, and 21 days' storage	2d.	1½d.
Ditto	Per pair (25 to 50 pairs to case), including grading, killing, dressing, packing, case, and 21 days' storage	1d.	1½d.
Ditto	Per pair (over 50 pairs to case), including grading, killing, dressing, packing, case, and 21 days' storage	0½d.	1½d.

* **Per Package per week following, or portion of week.**

SCALE OF CHARGES, GOVERNMENT COOL STORES, MELBOURNE—*continued.*

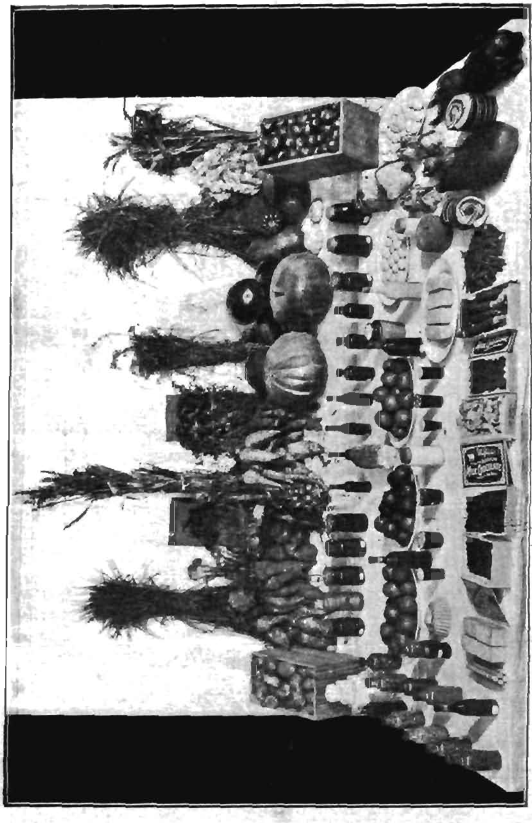
Produce.	Treatment, &c.	Rate.	STORAGE.*
Rabbits—Furred ..	Per crate of 12 pairs for export, including grading, packing, crate, handling, branding, and shipping, and 21 days' storage	1s. 10d.	1½d.
Ditto—skinned ..	Per pair, for export, including as per Furred Rabbits	1½d.	1½d.
Hares	Per pair, for export, including as per Furred Rabbits	4d.	2d.
Mutton	Per carcass, including handling, freezing, loading, bagging, calico wrap, and 21 days' storage	10d.	1½d.
Lamb	Per carcass, including handling, freezing, loading, bagging, calico wrap, and 21 days' storage	8d.	1½d.
Pork	Per carcass, including handling, freezing, loading, bagging, calico wrap, and 21 days' storage	10d.	1½d.
Ditto	Per side, including handling, freezing, loading, bagging, calico wrap, and 21 days' storage	6d.	1½d.
Veal	Per carcass (under 100 lbs.) including handling, freezing, loading, bagging, calico wrap, and 21 days' storage ..	1s.	.
Ditto	Per side (under 50 lbs.), including handling, freezing, loading, bagging, calico wrap, and 21 days' storage	9d.	1½d.
Beef	Per body, including handling, freezing, loading, bagging, calico wrap, and 21 days' storage	10s.	2s.
Beef	Per quarter, including handling, freezing, loading, calico wrap, and 21 days' storage	2s. 6d.	6d.
Ditto	Per piece (⅛ of carcass), including handling, freezing, loading, calico wrap, and 21 days' storage	1s. 3d.	3d.
Meat	Sundries, per 50 lbs., including bags, handling, &c. (cases extra)	1s.	2d.
Ditto	Kidneys, packed in cases of 20 dozen, including case	1s.	1d.
Ditto	Kidneys, packed in cases of 10 dozen, including case	9d.	0½d.
Fruit	Per case, for export from date of receiving, and two weeks' storage	3d.	1½d.
Ditto	Per case, for storage for first two weeks, or any portion thereof	3d.	1½d.

NOTE.—Extra labour incurred by *Double Bagging* of mutton, lamb, pork, veal, or beef will be charged for at the rate of ½d. per carcass or piece. Quarters of beef, ½d. each: or bodies of beef, 2d. each. Hessian wrappers will be charged for extra at Schedule prices.

Weighing of mutton, lamb, pork, veal, beef, &c., up to 10 per cent. included in above scale of charges. Additional weighing will be charged for at the rate of ½d. per carcass of mutton, lamb, veal, pork, or pieces of beef; ½d. for quarters, and 2d. for bodies of beef. Carcasses of veal over 100 lbs., and sides of over 50 lbs., will be charged for at the rate of 6d. per 50 lbs. or part thereof.

Re-branding of crates, cases, &c., including removal of other brands, ½d. extra. Additions to brands of crates, cases, &c., not including removal of brands, ¼d. extra. Butter, &c., arriving at the Cool Stores, and taken delivery of the same day, before being put in freezing rooms, will be charged 1d. per case. All charges must be paid by the Shipper or his agents, together with freight, &c., before obtaining delivery of bills of lading.

* Per Package per week following, or portion of week.



MR. T. BOUND'S EXHIBIT OF FARM PRODUCTS.

AN EXHIBIT OF FARM PRODUCTS.

As an illustration of what can be accomplished under conditions which are generally considered as very unfavourable is seen in the collection of farm products exhibited by Mr. T. Bound at Nhill. Mr. Bound's farm consists of 640 acres of third-class land, in the "Little Desert," 13 miles south of Nhill. The soil is of the usual light sandy character, and the rainfall averages 18 inches. Only about one-half the selection has up to the present been touched, the remainder still being covered with the dwarf scrub, which yields very little fodder of service to the farmer. Mr. Bound has about 300 acres under cultivation, of which 200 are cropped each year as follows:—100 acres wheat, 40 oats. 12 peas, 15 market garden vegetables, and 20 orchard. Beside the team of horses, the live stock comprises eight milking cows and a small flock of sheep. Usually at least 40 pigs are fattened each year.

The accompanying illustration gives some idea of the wide range of products raised on the farm. The sheaves of wheat, oats, barley, peas, and melilotus indicate the chief products of the broad acres. It is interesting to find that the wheat yield is well up to the average in the north-west, the sandy soil giving relatively very good returns in dry years. The leguminous crops grow well, the peas giving almost invariably a satisfactory return. The melilot appears to have secured a good hold on the sandy soil. Pigs and pig products form important items in making up the yearly income from this farm, and consume the greater part of the peas and root crops, as well as the waste of the orchard. Butter and cheese are produced from the dairy herd. The "market garden" area yields roots, cabbage, and kale for the pigs and cows, and potatoes and tomatoes to be placed on the market. It is seldom that the potato is raised in large quantities to the north of the line of 25 inches of rainfall, but Mr. Bound has demonstrated what can be done in this direction. Four acres of tomatoes are raised every year, most of the yield being made into tomato sauce on the farm. Onions form another crop not usually grown in the north, but which is one of the most successful on the farm under review.

In the large orchard almost every kind of fruit flourishes with great luxuriance. Apples, grapes, and apricots are the three kinds chiefly cultivated and not only yield well but are also unusually free from pests of all kinds. The fruit is partly placed on the market in the fresh state, and partly bottled, or otherwise preserved. In fact the display of jams, jellies, raisins, and dried and preserved fruits is one of the features of the exhibit. No better display can be found of the wide variety of products of economic value which can be grown and prepared on an average Victorian homestead, and there is no doubt that if this were the rule instead of the exception farmers would be much more independent of the markets and of the season. Diversified production not only develops the resources of the farm, but renders the home nearly independent of the storekeeper. More than 90 separate products come from this single Wimmera farm. It will be seen that it is not necessary to have rich land or heavy rainfall to make a prosperous home.—T.C.

PURE LACTIC ACID CULTURE FOR RIPENING CREAM.

DIRECTIONS FOR USE.

The bottle containing the pure culture must be kept firmly corked in the case and in a cool place. It should not be opened until ready for use.

The milk to be used for a "starter" should be the best available, free from taint and ill-odour, and obtained from selected dairies.

It is essential that special care be observed to secure absolute cleanliness, both during the process of milking and in the subsequent treatment of the milk. The first tablespoonful from each teat should be rejected.

The milk ought to be cooled and aerated immediately after milking.

At the factory it should be slowly run through the separator in order to separate the cream and remove as much of the impurities as possible.

After leaving the separator, pasteurize at a temperature of about 180 degrees for one hour. This can be readily accomplished by standing the vessel in a vat of water heated by steam. During the heating process stir the milk occasionally with a sterilized or clean glass rod. Cover the can with scalded butter-cloth, four-fold thick, to exclude air organisms. Cool down rapidly to 80 degrees Fah.

The bottle of pure culture is *sufficient* for about 4 gallons of pasteurized skim milk. Agitate the culture well and gradually add to the milk, stirring freely with the glass rod. Repeat the stirring operation at least three times during the first hour; then set the vessel in a suitable place, where a temperature ranging from 70 to 90 degrees Fah. can be maintained. It must be kept covered with the butter-cloth, and the atmosphere ought to be pure.

It will be found that the "starter" is coagulated in from 18 to 24 hours, when it will possess an agreeable sweet odour.

If required coagulation may be hastened by raising towards the higher temperature.

As soon as coagulation is complete, the "starter" should be transferred to a cool dark room, with a temperature not exceeding 60 degrees Fah., until it is required for use.

It is advisable to skim the surface of the "starter"; break it up freely with the glass rod, and add from 5 to 10 gallons to 100 gallons of cream, at a temperature not exceeding 70 degrees Fah., with continuous stirring. The cream should be gently stirred at least twice a day in vat.

The cream room should be clean, well lighted, and ventilated to secure healthy and even ripening.

Special care must be devoted to the sterilization of all the vessels and utensils used by applying steam to them.

To continue the "starter" it must be renewed from day to day by adding 10 per cent. of the previous day's "starter" to the freshly pasteurized skim milk.

The "starter" improves by repeated inoculation or daily renewals, provided strict care be taken to prevent contamination, and only fresh, pure, clean, separated milk be employed. Under such conditions the "starter" may be maintained in full and healthy vigour for a month or longer, when it will be necessary to obtain a fresh culture from the Department's Laboratory. Applications for same should be addressed to the Superintendent of Exports, Government Cool Stores, Flinders-street, Melbourne.—R.C.

STATISTICS.

Rainfall in Victoria.

THIRD QUARTER, 1907.

TABLE showing average amount of rainfall in each of the 26 Basins or Regions constituting the State of Victoria for each month and the quarter, with corresponding monthly and quarterly averages for each Basin deduced from all available records to date.

Basin.	July.		August.		September.		Total for Third Quarter.	Average for Third Quarter.
	Amount, 1907.	Average.	Amount, 1907.	Average.	Amount, 1907. *	Average.	*	
Glenelg and Wannon Rivers	3·70	2·91	3·86	3·10	1·21	2·71	8·77	8·72
Fitzroy, Eumerella, and Merri Rivers	3·53	3·37	3·98	3·19	1·80	3·08	9·31	9·63
Hopkins River and Mount Emu Creek	2·59	2·29	3·05	2·43	1·32	2·55	6·96	7·27
Mount Elephant and Lake Corangamite	2·29	1·90	3·20	2·34	1·77	2·39	7·26	6·63
Otway Forest	4·30	3·68	4·28	4·01	1·89	3·52	10·47	11·21
Moorabool and Barwon Rivers	2·36	2·31	3·14	2·38	1·08	2·60	6·58	7·29
Werribee and Saltwater Rivers	1·76	2·11	2·04	2·48	0·53	2·39	4·33	6·98
Yarra River and Dandenong Creek	3·35	3·10	3·42	3·06	1·49	3·26	8.26	9·42
Koo-wee-rup Swamp ...	3·51	2·94	4·41	2·94	1·46	3·26	9·38	9·14
South Gippsland	3·48	3·41	4·85	3·95	2·27	3·66	10·60	11·02
Latrobe and Thompson Rivers	3·54	2·71	4·62	3·53	2·31	3·36	10·47	9·60
Macallister and Avon Rivers	0·81	1·53	2·09	2·45	1·56	2·08	4·46	6·06
Mitchell River	0·66	1·91	1·67	2·65	0·62	2·33	2·95	6·89
Tambo and Nicholson Rivers	0·66	2·20	1·54	2·61	1·02	2·15	3·22	6·96
Snowy River	0·81	3·44	1·91	3·27	1·17	3·06	3·89	9·77
Murray River	2·17	1·86	1·66	2·26	0·70	1·83	4·53	5·95
Mitta Mitta and Kiewa Rivers	3·65	3·11	3·42	3·33	1·05	3·05	8·12	9·49
Ovens River	4·12	3·89	3·91	4·29	1·17	3·99	9·20	12·17
Goulburn River	2·97	2·34	2·76	2·83	1·06	2·31	6·79	7.48
Campaspe River	2·88	2·24	2·51	2·69	1·27	2·18	6·66	7·11
Loddon River	2·16	1·48	1·86	1·92	0·71	1·54	3·73	4·94
Avon and Richardson Rivers	2·30	1·28	2·00	1·68	0·84	1·33	5·14	4·29
Avoca River	2·09	1·42	1·80	1·74	0·49	1·35	4·38	4·51
Western Wimmera	2·69	2 14	2·83	2·27	0·57	1·84	6·09	6·25
Eastern Wimmera	3·34	2·16	2·89	2·37	0·53	1·88	6·76	6·41
Mallee Country	1·65	1·15	1·76	1·37	0·43	1.06	3·84	3·58
The whole State	2·47	2·21	2·67	2·51	0·99	2.21	6·13	6·93

* Figures in these columns are subject to alterations when the complete number of returns for September has been received.

P. BARACCHI,

Government Astronomer.

Perishable and Frozen Produce.

QUARTERS ENDED 30TH SEPTEMBER, 1907 AND 1906.

Description of Produce.		Exports from the State.		Deliveries from the Government Cool Stores.	
		1907.	1906.	1907.	1906.
Butter ...	... lbs.	3,779,800	5,647,540	1,757,880	3,024,896
Milk and Cream	... cases	11,898	4,043	...	160
Cheese ...	... lbs.	220,440	235,080	180	44,078
Ham and Bacon	... "	671,040	486,000	...	...
Poultry ...	... head	4,365	18,270	1,704	3,705
Eggs... ...	... dozen	30,870	11,358	12,591	2,903
Mutton and Lamb	carcasses	9,454	8,937	2,229	5,504
Beef	quarters	225	2,065	...	...
Veal	carcasses	1,559	1,606	76	90
Pork... ...	... "	243	745	33	497
Rabbits and Hares	... pairs	2,007,432	1,793,548	527,826	478,440
Fruit ...	... cases	6,418	7,483	564	835
" Pulp ...	... "	...	839	...	...
Sundries ...	... lbs.	...	...	3,734	6,537

R. CROWE,
Superintendent of Exports.

Fruit, Plants, Bulbs, Grain, &c.

IMPORTS AND EXPORTS INSPECTED DURING QUARTER ENDED 30TH SEPTEMBER, 1907.

Goods.	Imports.		Exports.		Goods.	Imports.		Exports.	
	Inter-State.	Over-sea.	Inter-State.	Over-sea.		Inter-State.	Over-sea.	Inter-State.	Over-sea.
Apples ...	7,509	—	1,026	4,818	Barley ...	1,819	25,126	—	—
Apricots ...	—	—	13	—	Beans ...	40	60	—	—
Bananas, b/s.	44,222	—	—	—	Grain ...	52	—	—	—
Bananas, c/s.	6,958	105	67	13	Maize ...	289	—	—	—
Cucumbers	274	—	2	6	Oats ...	2,358	—	—	—
Lemons ...	5,639	—	124	1,449	Rye ...	139	—	—	—
Loquats ...	175	—	1	—	Nuts ...	9	888	1	—
Melons ...	19	—	—	—	Nutmegs	—	124	—	—
Mixed fruits	462	6	—	89	Peas ...	297	79	4	—
Oranges ...	131,776	1	531	1,309	Potatoes	40,878	—	—	—
Passion fruit	4,857	—	244	1	Turnips...	3,116	—	—	—
Pears ...	1	—	4	30	Rice ..	—	17,827	—	—
Persimmons	19	—	—	—	Seed ...	1,435	3,736	20	2
Pineapples	16,449	—	278	188	Wheat ..	60	71	—	—
Strawberries	140	—	—	—	Yams ...	51	138	—	—
Tomatoes ...	904	—	1	40	Cnd. fruits	—	—	—	8,442
Plants ...	281	82	40	195	Jams,				
Bulbs ...	—	8	3	—	Sauce, etc.	—	—	—	1,457
					Drd. fruits	100	2,752	4	6,604
Totals ...	219,685	202	2,334	8,138	Grand Totals	270,828	51,003	2,363	24,743

Total number of packages inspected for the quarter = 348,337.

J. G. TURNER,
Senior Inspector, Fruit Imports and Exports.

THE JOURNAL

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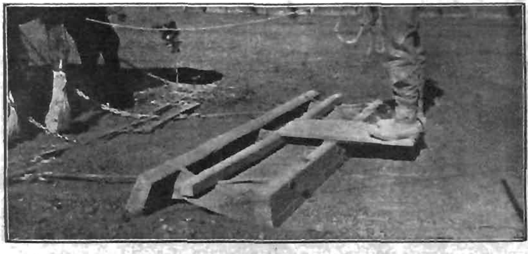
Vol. V. Part 12. 9th December, 1907.

GRADING AND LEVELLING.

(Continued from page 536.)

A. S. Kenyon, C.E., Engineer for Agriculture.

Of varieties of the buckscraper there appears to be no end. Doubtless each one of them has its special merits. The most primitive is the single split log; a section of a well shaped round log split to give an angle of about 60 degrees, a pitch similar to that shown in the illustration, forms an excellent means of levelling rough ground where the bumps and hollows are small and numerous. For spoil banks and formations it will be found very serviceable though not equal to the double split log already described.

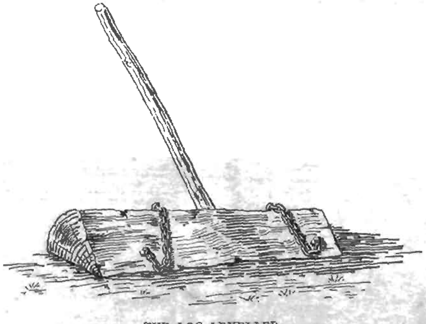


THE SMOOTHER IN OPERATION.

Reference has been made to the use of the wooden buckscraper on the Werribee Sewage Farm. Mr. Lester, the manager, who uses the implement very largely, has made some additions and improvements which give it a greater capacity. It is, however, a good four-horse load and requires one man for handling it alone, necessitating the employment of a driver. The depth is increased to 15 inches or double that of the original.

The handle is somewhat longer and heavier, and has an iron strapped eye on the end for the rope attachment. The shape of the ends or rockers is peculiar and has, it is understood, been evolved only after long experimenting. With a scraper so heavy as this type, any method of easing the work of tipping or handling is of importance and it is claimed that the curve shown causes the re-tipping to be performed with the least effort on the part of the man using it. On the face of the rocker is bolted a piece of flat iron ⅝ inch thick by 2½ inches wide and 19 inches long. The bolts are passed through 1 inch pieces split back at the ends and turned down the sides. The draw chains, which are 4 ft. 6 in. long, are attached to ringbolts passing through 2½ inches by ¼ inch iron straps, two at each end, being both inside and outside. Three holes are provided as shown for varying draughts and work.

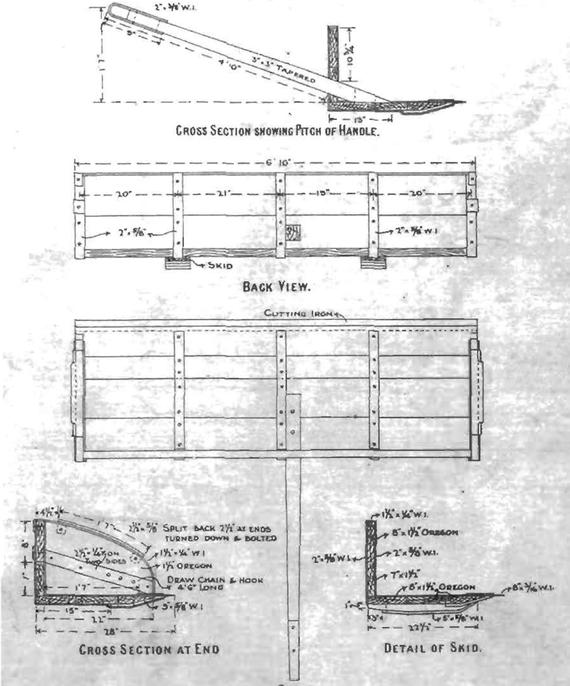
At the farm, the final operation of smoothing is performed by the wheeled scraper known as the American road machine. Levelling and grading work on a gigantic scale are carried on at the farm under excellent and economical methods; but the purpose, the disposal of large volumes of sewage profitably and quickly, is so unlike anything likely to occur in ordinary irrigation practice that no further reference is called for in the present article.



THE LOG LEVELLER.

There appears little need to describe or illustrate the various forms of the ordinary scoop. They are essential farm implements but unless in exceptional cases, are not so useful as the buckscraper for levelling work. For small jobs, the pressed bowl one-horse scoop with fixed handles is a good working type. It will take at a trip about ⅙th of a cubic yard measured in the solid. For anything like big work and moderate leads, the four-horse skid scoop is usually employed. Each smith has his own little peculiarities of type, but the dimensions generally are 4 feet along the cutting edge, 3 feet depth and 1 ft. 3 in. in height. It will shift over half a cubic yard at a load. The draw bow works on pins fixed near the middles of the sides, and to these pins, the handles are also loosely attached. The handles are about 7 feet long and work in and under lugs fixed at the back of the scoop. By these means,

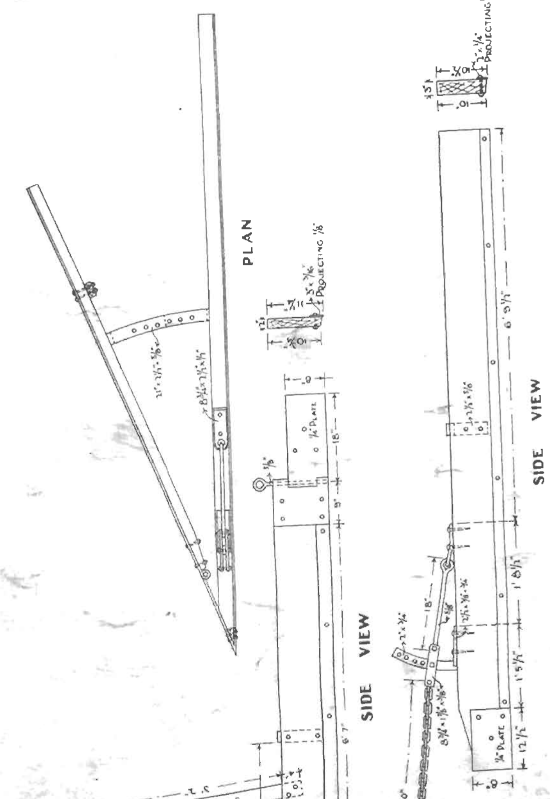
the scoop is kept under control for filling or tipping. If specially long leads are expected wheels about 20 inches in diameter are used, the side pins for the draw bow and handles forming also the axles for these. The



THE LESTER BUCKSCRAPER.

American type of wheel scoop with large wheels and complicated arrangements for lifting &c. is not recommended as the saving in draught is more than balanced by greater complexity and consequent trouble in working.

Having made a satisfactory job of the grading and levelling preparatory to laying down in irrigated crops, the next thing to do is to



THE V-SCRAPER OR DELVER.

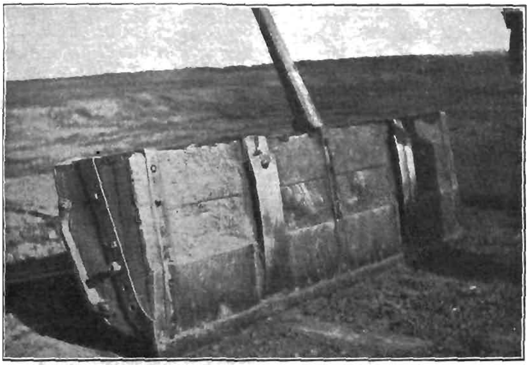
construct the needed distribution works. From the outlet in the main supply channel, a distributary channel has to be made with minor distributaries depending upon the area, slopes and other conditions. If these are of large size the buckscraper may again be called upon, or if the ground be light and sandy, the Perkins scraper will do the best work. In ordinary cases, the V-shaped scraper, delver or crowder is the implement.

The bed of the channel must first be ploughed for its full width, and the scraper is then run along, the lighter and shorter plank acting as a mould-board, pushing the loosened earth to one side to form a bank. By running in one direction only, the earth may be placed all on one side; by alternating, both banks may be made. Channels 2 ft. 6 in. deep with banks of 2 feet in height may be made in this way; but, of course, without any berm or cess from the edge of the cutting to the toe of the bank. The channel is in fact V-shaped, like the implement making it.

GENERAL VIEW OF BUCKSCRAPER.—WERRIBEE SEWAGE FARM.

The drawings very fully show the method of construction while a very little experience will teach its use. The mould plank or lighter board, may with advantage be hinged just behind the extension arms, if working in crab-holey country. The timber is preferably redgum, on account of its weight and resistance to bard usage. The delver may be made in any size although that figured is the most generally useful. The strength of team required will of course, vary with the work. In light ground three horses will work the figured size; but generally four will be wanted. Rougher implements may be fixed up to do serviceable work, the original type being merely a forked tree or sapling, adzed down to something like shape and protected here and there with pieces of iron.

From the illustrations given in this and the preceding articles, the



THE BUCKSCRAPER IN POSITION FOR DISTRIBUTING.

ordinary handy man with the necessary tools and a forge should be able to make sufficiently serviceable implements, getting in all probability,

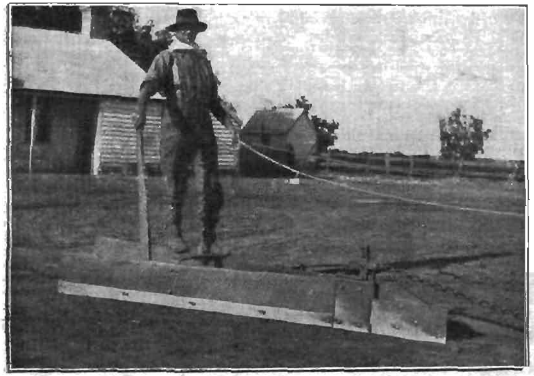
THE BUCKSCRAPER DISTRIBUTING.

some of the iron-work done by the local blacksmith. As a guide, the

following prices are quoted, as having been paid for implements to use on the Wyuna farm.

7-ft. Steel Buckscraper	£7 0 0
7-ft. Wooden ,, ...	4 10 0
9-ft. Delver	3 0 0
Smoother	3 10 0

In conclusion, too great stress cannot be laid upon the necessity for careful grading and levelling of paddocks intended to be irrigated. Whether water is to be distributed by simply flooding, by checks or by furrows, loss of time, loss of water, loss of temper and loss of crop will always attend attempts to water uneven ground. The removal of the surface soil from one spot to another will, to some extent, lessen the fertility at one place though increasing it at another; but with careful



THE DELVER.

use of water and liberal employment of manures, little if any effect of the levelling operations should be visible in the growth of the irrigated products. The operations are not costly and the increase in yields and improvement in quality due to ability to water evenly and thoroughly will in most seasons repay the initial outlay. Very good work can be done under favorable conditions for a few shillings per acre, not including, of course, the cost of the distributing channels, checks or laterals. Ten shillings per acre implies heavy work, though in exceptional cases of river flats of very high quality, much bigger sums have been spent. If land by proper grading can be made, under irrigation, to give returns only equalled under natural conditions by the richest of our river flats, it would seem rank folly not to endeavour to get the best results, the outlay being more than repaid in the increased capital value of the land alone.

FIRST PROGRESS REPORT ON VITICULTURE IN EUROPE.

F. de Castella.

(Continued from page 698.)

Hybrids.

Riparia x Rupestris.—By crossing these species it has been possible to raise seedlings retaining the characteristics of both parents. As the result of the most rigorous selection a few have been sorted out which have inherited the qualities without the defects of the parents. Chief among these are three vines which certainly rank among the most valuable resistant stocks and which are those most largely used in Victoria. They are Nos. 3306 and 3309 of Couderc and No. 101^{14} of Millardet. In France also these are the best known Riparia Rupestris hybrids. No. 3309 is perhaps one of the most valuable stocks we possess. During my travels I have come across it very frequently both in vineyards on a large scale and in experimental plots. I have not in a single instance heard any complaints concerning it. It is one of the rare stocks which seem to give good results everywhere. In the numerous experimental plots near Montpellier I have always found it to be one of the best, both as regards vigour and fruitfulness. In the Hermitage district it is now used exclusively as the stock for the Syrah (Shiraz or Red Hermitage). It resists drought in a high degree, being the best of the three for dry situations. From what I have seen I think it safe to predict a great future for this stock in Victoria. It will be interesting to note the opinion formed of it in Spain, Algiers and other dry countries.

No. 3306 is usually to be found alongside of 3309 in experimental plots. It is as a rule equally satisfactory though of slightly less vigorous growth. No. 3306 takes rather more after its Riparia parent and 3309 after its Rupestris one. This is probably the cause of the slight superiority of the latter in most experimental plots for these are usually established in soils where the effects of drought are felt and not in Riparia soils where almost any American stock will thrive.

Though both these stocks have a wide range of adaptation, leading authorities consider 3309 best suited for dry hill-sides, and 3306 for stiff clays and sour, wet soils; for these it has displaced Solonis, a stock which will be referred to presently.

No. 101^{14} seems to be the one of the three which most resembles its Riparia parent. For this reason it is usually inferior to the other two in the dry soils of most experimental plots. It is nevertheless a stock of great value in soils which suit it. These are deep, rich, moist and well drained—"Riparia" soils in fact. In these it is to be preferred to Riparia Gloire chiefly on account of its greater durability when grafted. I have occasionally seen 101^{14} giving disappointing results, but only in soils where Riparia did not thrive. It bids fair to supplant Riparia in Riparia soils.

Solonis.—This is a rather complex hybrid which was very popular in the early days of French reconstitution. It possesses some valuable qualities such as fruitfulness of its grafts and adaptability to limestone soils,

but has been generally discarded owing to its insufficient resistance to phylloxera (14 points of a maximum of 20). It was long in favour for damp and even brackish soils in which most Americans will not grow. Even in these soils it has now been discarded in favour of No. 3306, which possesses its qualities without its defects.

HYBRID NO. 1616.—This is a Solonis x Riparia which has, I think found its way to Victoria. Like its Solonis parent its grafts are fruitful and it is recommended for sour and brackish soils. Near Montpellier, No. 3306 is now generally preferred to it even for these special soils.

FRANCO-AMERICAN HYBRIDS 1202 AND A.R.G.1.—Franco-American hybrids are those resulting from the crossing of French vines with one or other of the American species. They are chiefly represented in Australia by No. 1202 and Aramon Rupestris Ganzin No. 1 which for convenience we may refer to as A.R.G.1. These Franco-American hybrids have been very extensively raised in France. By a rigorous selection it has been possible to sort out a few combining in a high degree the good qualities of both parents, that is to say, the resistance to phylloxera of the American with the facility of adaptation to difficult soils of the European parent. One of the chief advantages of these stocks is the affinity they possess, owing to their partly European origin, for bad scions—that is, for sorts which do not thrive when grafted on most American stocks. For a long time it was feared that their resistance to phylloxera would not be sufficient, that they would inherit from their *Vinifera* parent some of its vulnerability, or lack of resistance to the insect. These fears appear to have been groundless so far as a few at least of these hybrids are concerned. After years of experimenting and practical use on a large scale their resistance to phylloxera has been proved to be amply sufficient.

No. 1202 is a Mourvedre x Rupestris. Its European parent, the Mourvedre is none other than our Australian Mataro. A.R.G.1 results from the crossing of the Aramon with the Rupestris Ganzin of the various seedlings resulting from this hybridization; Nos. 1, 2 and 9 showed their superiority and have alone been used on a large scale. No. 1 is the one which has been introduced to Victoria. Here I have repeatedly seen both these stocks both in vineyards and experimental plots under varied conditions of soil and climate and have carefully examined them and made inquiries as to their resistance to phylloxera. In only one single instance have I seen 1202 suffering slightly from the attacks of the insect. I have never seen A.R.G.1 affected. The case where 1202 was damaged was at the experimental plot of *Mas de las Sorres*, and in exceptionally bad soil. The expert viticulturist who was with me at the time considered it to be the result of last year's drought and that the damage, which was slight, was only temporary, the phylloxera always doing more damage in a dry year. I merely place it on record as the dryness of many parts of Victoria renders extreme caution necessary. In large numbers of other cases have I seen 1202 growing in the midst of phylloxera frequently among other vines, such as hybrids of insufficient resistance, which were dying from the attacks of the insect. 1202 was always remarkably vigorous and healthy. I have so far been unable to hear of a second instance where its resistance was not amply sufficient. 1202 is used on a very large scale and everywhere gives great satisfaction. It is, in fact, a favorite stock for difficult soils and for scions which have poor affinity for American vines. As a rule the fructification of its grafts is good, though it shares to a slight extent an excessive vigour of its Rupestris parent which sometimes interferes with

proper setting of the fruit. A.R.G.1 shares the qualities of the previous stock. Its grafts seem to set their fruits slightly better, but on the other hand it is perhaps a little more difficult to graft. On the Rhone, at St. Peray and Cornas, A.R.G.1 is preferred to all others as the stock for the Viognier a choice white cepage of that district which possesses poor affinity for most American stocks.

Both these hybrids are most valuable stocks which have in all probability a great future in Australia, especially for such difficult scions as Gordo Blanco.

Poor Affinity of Gordo Blanco.

On all sides I hear complaints as to the difficulty of finding a suitable stock for the Muscat of Alexandria. The close relationship of this vine to our Gordo Blanco renders this fact interesting to our growers. No raisins are grown in France, but the Muscat of Alexandria is much cultivated as a table grape. Grafted on Riparia it only lasts a few years and on Rupestris it bears no fruit. Strange to say other Muscats such as that of Frontignan and Snow's Muscat Hambro' do not share in this defective affinity, but thrive on several different stocks. In Spain I hope to obtain some useful information as to the stocks used for Gordos, but so far as can be learnt from French experience our raisin growers may have trouble in suiting their Gordos with a stock. So far as I have been able to ascertain the stocks which give the least unsatisfactory results in France are A.R.G.1 and some stocks which are as yet unknown in Australia, notably 420A, 62-66, 84-3 &c.

Stocks New to Australia.

Hitherto I have confined my remarks to stocks which have been introduced into Victoria. In addition to these there are several as yet unknown to us, which have within a few years come rapidly to the fore, and in certain conditions of soil and climate are now proving themselves superior to several of the older stocks. Hybrid No. 93-5, a Vinifera x Rupestris, is proving of the greatest value in the very dry compact soil of Oran, Algeria. Several other hybrids, some of which contain some sap of Vitis Cordifolia and Berlandieri in their composition are rapidly gaining in popularity and bid fair, especially in drier situations, to supersede some of the older stocks.

Vitis Berlandieri and its Hybrids.

Vitis Berlandieri was first studied in France on account of its adaptability to extremely calcareous soils. It was soon found to possess in addition several other most valuable qualities; amongst others, strong affinity for most European scions, thus insuring great durability for its grafts. These are also remarkably vigorous and fruitful, and the quality of the fruit is excellent. It shares with Riparia the property of diminishing *coulure* or non-setting of the fruit, but is free from the defects of that species.

V. Berlandieri grows wild in the driest and most barren parts of the State of Texas. It is therefore one of the most drought-resisting species. Wherever I have seen it the vigour of vines grafted on it has been remarkable, as also the quantity and quality of their fruit. Its one defect is the

difficulty with which its cuttings strike; this renders its propagation on a commercial scale almost impossible. But for this fault V. Berlandieri would certainly be one of the most popular stocks. This difficulty has been overcome in an indirect manner by the raising of hybrids between V. Berlandieri and other species which retain in a high degree the precious qualities of the Berlandieri parent, whilst they can be struck and grafted almost as easily as Riparias, or Rupestris. Among the most promising of these are the Berlandieri-Riparia hybrids Nos. 420A, 34 E.M., 157-11 and 161-49. Several Vinifera Berlandieri hybrids have, like the other Franco-Americans already referred to, proved themselves resistant to phylloxera. The Nos. 41B., 333 E.M., and 62-66 are deserving of special note. These Berlandieri hybrids are excellent for scions of faulty affinity. It is probable that one suitable for the Gordo Blanco may be found among this group. This fact, as well as their resistance to drought renders their introduction, as well as that of a few others, into Victoria, exceedingly desirable.

Introduction of New Varieties both for Stocks and Scions.

In my instructions I have been directed to report as to the desirability of introducing the more modern stocks referred to above. From what I have already seen I am of opinion that the importation of the latest stocks is urgently needed. In Victoria we have not the high percentage of lime in our soils which gave so much trouble in the early days of French reconstitution. We have however occasional long periods of dry weather and also in many cases stiff clay subsoils, both of which are undesirable for the majority of American stocks. It is therefore of the greatest importance that we should keep quite up to date and the importation of a limited number of all the more promising new stocks for experimental purposes is earnestly recommended. As regards those new stocks which have proved their superiority and are no longer in the experimental stage, I am of opinion that a sufficient number of rooted plants of these vines should be secured to enable plantations of mother vines to be immediately made. If the decision to propagate in Victoria all the grafted vines needed for Victorian reconstitution be adhered to, a vast amount of grafting wood will be necessary and the number of our mother vines will have to be considerably increased. At the present stage it is unnecessary to finally decide as to which stocks should be ordered and my experience in hot countries such as Spain, Portugal, and Algiers may somewhat modify the list.

I beg further to recommend that arrangements be made for the immediate purchase of sufficient of each new stock to permit of the establishment of experimental plots in different districts. I feel sure that these can be carried out with the co-operation of leading growers in each district, as has been done in France, and that they would be the means of acquiring the most valuable and reliable information on the subject.

I also beg to recommend the importation of several French table and wine varieties which would, in my opinion, be very desirable acquisitions in addition to the importation of the choicest wine varieties of Spain and Portugal asked for by the Viticultural Society of Victoria. I am convinced that this latter importation will be of great importance to the Victorian wine industry.

INSECT PESTS IN FOREIGN LANDS.

Second Progress Report by Mr. W. W. Froggatt, F.L.S.

(*Continued from page* 685.)

I have the honour to report that I reached California on the 21st August and as soon as I landed presented my credentials to Mr. Bremner, Acting Officer-in-Charge of the State Board of Horticulture. The insectary consists of a few jars and breeding cages in a small room adjoining the main office and is not more than 12 feet square, whilst the chief insects are the codlin moth parasites that Mr. Compere brought over from Spain, which have been bred in captivity in large numbers by placing thousands of codlin moth grubs among half-a-dozen strips of wood tied in bundles of half-a-dozen. The ichneumon flies (*Ephialtes carbonarius* Zach.) puncture the enclosed codlin moth grubs and deposit their eggs in the body of the grub where they hatch, feed, pupate and emerge in the cages as perfect wasps.

In the afternoon I went on the wharves with Mr. Bremner to see the methods of passing fruit under their regulations. The chief fruit upon the wharves was bananas, each bunch being rolled and tied up in leaves. None of these are inspected, as bananas are not grown in California. A large shipment of pineapples also came over from Honolulu from the United States Experimental Station to Mr. Higgens, the Hawaiian fruit expert. These were not inspected in any way, but a number of small consignments in large boxes closely packed in grass were stacked on the wharf, an oiled sheet thrown over them, and an unmeasured charge of cyanide, acid and water placed in a jar under this sheet and left there for half-an-hour; the sheet was then dragged off, and the carriers removed them. There were a number of other stacks of fruit around on the wharf which were removed without fumigation, but Mr. Bremner informed me these would be fumigated by the fruit merchants in their own warehouses. All plants and little lots of fruit brought by passengers on boats outside Californian ports are treated in the same manner.

Next day I went across to Alameda and found Mr. Koebele, and also with him Mr. Giffard, head of the Sugar Planters' Association of Hawaii. Mr. Koebele has been able to give me a great deal of general information on parasites and has given me the free run of his large entomological collections. He is going down to Mexico to collect parasites for the Hawaiian Planters' Association next month, so I expect after leaving Washington to go southwards and meet him at El Paso and while I am in Mexico will have his knowledge of that country, which will be an immense advantage in working at the fruit flies attacking the oranges there.

As the town of San Francisco is in such a disorganized state I came across the bay and made Alameda my headquarters; the same day I visited Berkeley University and met Dr. Woodworth who is Professor of Entomology. He has been very kind and gone with me to several interesting districts to study insect pests. With him I visited Watsonville and spent a long day in the apple orchards of Pijari Valley, which is situated between Monteroy and Vera Cruz, and contains about 14,000 acres of commercial apple orchards. The fog sweeps on from the sea for the greater part of the year and the conditions of codlin moth and spraying are remarkable, as in different altitudes the codlin moth is very variable

in its attacks, but during the last season a series of experiments have been carried out by Mr. W. H. Volck (County Entomologist). Spraying is universal throughout this section, the growers spraying with arsenite of lead from three to five times in the season; 30,000 lbs. of this material have been sold and used in this district, which Mr. C. H. Rogers (County Horticultural Commissioner) informed me had produced last year fruit valued at 1½ million dollars. No bandages are used on the trees for codlin moth when systematic spraying is carried on, but in many places the trunks of the apple trees were bound round with rope soaked in stickfast to prevent the tent moth caterpillars getting up into the trees, which unlike the tussock moth caterpillars cannot be killed with arsenical sprays. Mildew of the apple foliage is another trouble sometimes, and up to the present no fungicide has been found effective. Where spraying is not carried out, codlin moth is just as bad as in Australia; in this valley a number of the codlin moth parasites (*Ephialtes carbonarius*) were turned out over a year ago, but none of the residents have ever seen them since. And I might state that I have been unable to find any instances in which this ichneumon parasite has been found in an orchard. Mr. Isaac (Commissioner at Sacramento) said he found two in his garden a few weeks before where a great number had been turned out in an infested apple tree, but I could find no traces of them, though codlin moth grubs were very plentiful. I asked all the officers of the State Horticutural Department if they could send me into an orchard where I could see this parasite working under natural conditions, but they did not know of any. The general opinion of all the apple growers, with whom I talked, is that this parasite is a failure up to the present time in California, and will not make the least difference in their spraying work.

My next visit was to Marysville, a centre of the peach and raisin grape industry, west of Sacramento. This town is famous for the "White Fly" scare (*Aleurodes citri*), a serious orange pest in Florida, which was discovered in many gardens in the town. Though there are no oranges grown in the neighbourhood a tram line runs through the town into an orange district some miles distant; a scare was started by these growers, the whole force of the Horticultural Commissioners was mustered, and notices were served by post on 600 residents informing them that they would have to top, cut down, or defoliate all the different kinds of trees known to be the food plant of the white fly, not because there was any danger to their gardens but on account of the danger to the orange growers miles away. The powers of the Commissioners are so great that all these householders had at their own expense to do all this work, destroying to a great extent many of their finest shrubs and whitewashing the remains. It cost a good many thousand dollars, and though the Horticultural Commissioners in some cases had to call on the police only one man took his case into the law courts and he lost it. It is now claimed that white fly is *exterminated* in Marysville. I quote this instance to show what powers the State Horticultural Commissioners have in California. In this district I visited Yuba, went through a number of vineyards where raisins were being dried, and several orchards; one large but neglected apple orchard was found to contain plenty of codlin moth.

From here I went on to Sacramento and met Mr. Isaac the Horticultural Commissioner in that town, who gave me a lot of valuable information regarding the insect pests of this district, introduced me to many of the leading exporters and arranged for me to visit several orchards.

On the apple trees at Mr. Cutter's I saw a leaf aphis that is unknown in Australia, covering the underside of the leaves and causing the foliage, young wood and even the stem to look as if it had been painted with oil. Here I might notice that woolly aphis is common in all apple orchards, but does not seem to do anything like the damage it does with us, even when neglected. No apples as far as I could learn are ever grafted on blight proof stocks, which are hardly known in most districts. Very fine peaches are grown in this district, but for the last three years a powdery mildew has attacked and killed back much of the young wood and when I saw them most of the trees had a couple of feet of defoliated wood at the tip of each branch, but were otherwise healthy.

The question of the bacterial disease known as "Pear Blight" is one of the most serious propositions that the fruit-growers of all parts of America have to deal with, and it has spread all through this country, all the pears are more or less affected, dying back from the tips. I was told that there are 2,000 acres of once fine pear orchards that are doomed. If such a regulation does not exist I would suggest that the importation of all kinds of pear-wood stocks, &c., be prohibited from any part of America, as it was introduced from the east of California, and is very easily spread. No remedy is known except cutting back bit by bit each dead branch and this is only a temporary check.

From Sacramento I went on to Lodi the centre of the table grape industry; some 50,000 acres of vines are growing in this part of the country, some wine and some table grapes. No irrigation is needed as the water is within 4 feet of the surface. Though phylloxera is well known all over California little or nothing has been done in planting the new vineyards with resistant stocks, as the growers say that by the time the vine louse reaches them they will have made the value out of their vines and saved the extra expense over cuttings.

My next visit was to the south of Los Angeles, stopping at Fresno to see Mr. Geo. Roeding in reference to the fig industry and the caprification of the Smyrna figs. Mr. Roeding sent me out to his manager who took me all round the fig plantation and showed me the methods they employed in introducing the Blastophagina among the Calimyrna figs. He considers that one insect is sufficient to cross fertilize a fig. I also went over the fig drying grounds, and saw a great number both of figs and grapes spread out to dry in the sun. Since the Pure Food Act has stopped to a very great extent the use of sulphur in the treatment of raisins and prunes a very large quantity of the grapes is not dipped in lye but simply spread in the sun.

Leaving Fresno at midnight I reached Los Angeles early next morning and went up to the Capitol where I found the County Horticultural Commissioners Office and introduced myself to Mr. Jeffrey, who, after giving me a general account of the district, gave me an invitation to attend the monthly meeting of the orchard inspectors about ten in number. After they had read their reports I gave them an address upon our work in Australia and we had a general discussion. As you are probably aware each of the fruit-growing counties of California has a County Horticultural Commissioner, who is appointed by the Supervisors (Councillors or Aldermen); he reports upon all insects, pests or other matters dealing with the fruit industry and is paid so much a day while doing horticultural work. He can appoint one or more inspectors who can visit orchards and instruct persons what to do to destroy pests, and in cases of neglect

notify in writing what action an orchardist must take. If the trees are not cleaned within a certain time the inspector can employ some one to do the work and recover the cost from the owner. In Los Angeles a large sum is expended in inspection, and over 9,000 orange trees were fumigated this season by the inspectors. The system of the County Horticultural Commissioners is very irregular in its administration, as many of them hardly do any inspection. The Lieutenant-Governor in Sacramento told me that he was going to bring in a Bill to make every fruit producing county pay an Entomologist to act as inspector and adviser to the Horticultural Commissioner.

On the following Monday accompanied by Mr. Jeffrey I went out by electric tram to Govina, where we met Inspector Bemish and drove all day through the orange groves of the San Gabriel Valley which contains about 8,000 acres of citrus orchards. We found a considerable amount of red and yellow scale upon old trees, but as the greater part of all these orchards had been fumigated during the last year they were generally very clean. The whole of this valley is irrigated by water from the adjacent mountains. The walnut orchards of Santa Barbara were visited next day on my way back by the coast road, and I reached San Francisco next day at 2 o'clock in the morning. My last expedition was to Santa Rosa northwards with Mr. Koebele round the orchards of that district where purple scale was said to be killed by a parasite. We sent our cards into Mr. Burbank, but did not see that gentleman. I also visited Paulo Alto to see Mr. Kellogg, the Professor of Entomology at Leland Stanford University, and obtained his opinions on entomological work in California, and saw the working of his office.

The observations made during my three weeks' investigations among the insect pests of the orchards as to the value of parasites, and the opinions of the leading men interested in the industry, all point to the same conclusions, namely, that in spite of the money and work that have been expended during the last twenty years in the State of California upon the introduction and propagation of foreign parasitic insects to destroy scale and other injurious insects, with one or two exceptions, they have very little commercial value, for unless they are effective enough to render the work of spraying and fumigation unnecessary they might as well not exist.

I have found all the orchards and garden pests (with the exception of fruit flies) quite as abundant and destructive in California as in Australia, and wherever the orchards are neglected they suffer in the same manner. Even with the drastic powers held by the officers of the State Board of Horticulture the orchards have to be cleaned by spraying and fumigating. In Los Angeles wherever one goes he finds fumigating tents. At Watsonville there are a dozen steam sprayers and many smaller outfits spraying for codlin moth; a large factory is established at Bernecia which does nothing else but turn out a liquid form of lime and sulphur wash, called "Rex," used for spraying San Jose scale. The small green chalcid wasp (*Scutellista cyanea*) introduced from South Africa through Mr. Lounsbury to destroy brown scale, though it has to a great extent cleared off this cosmopolitan scale from the pepper trees and other ornamental garden trees, has made little or no difference to olive scale in the orchards. All the orange trees in the parks and side walks are covered with red scale, smut and aphis, and yet one can see many small native parasitic wasps crawling about on the leaves among the scale of which they have no doubt destroyed a certain percentage.

The contention that where parasites were introduced, it would not be necessary to take any mechanical methods to destroy insect pests, is certainly not borne out by the present conditions of orcharding and orchards in California. There is no question that the native, and not the introduced chalcid wasps parasites, are doing as much work in devouring the percentage of scale insects that are their natural food, but as for either native or introduced parasites exterminating a pest when once it is firmly established, it has never happened yet. In Mr. Carne's list of the *Coccidæ* of California, he enumerates about 135 species a 100 of which are more or less thoroughly established in California, and a dozen of which are serious orchard pests.

There is one curious thing in connexion with the *Aspidiotus auranti*, the red scale of orange common both to Australia and California, and that is that here they claim there is a second species that is known as yellow scale (*Aspidiotus citrinus*) which is never found upon the stems or young wood, but only upon the fruit and foliage, and thus it never does the injury to the trees that the true red scale can in killing back the young wood. The only difference that I can find is in the colour and flatness of the disc of some of the scale upon the foliage.

The codlin moth parasite, as previously pointed out, in spite of Mr. Compere's accounts of its work, and the offer of a colony by the State Board of Horticulture to several of our States for £1,000 each, has done nothing outside the office insectarium.

In conclusion I have to thank Professor Woodworth of Berkeley College for arranging and accompanying me on country visits, the officers of the State Board of Horticulture at San Francisco, Messrs. Elehoun. Bremner, and Cairns, for a great deal of valuable information. Mr. Isaacs of Sacramento, who showed me round his district, and the County Horticultural Commissioners whom I met in different districts.

THE PROCLAIMED PLANTS OF VICTORIA.

(*Continued from page 680.*)

Alfred J. Ewart, D.Sc., Ph.D., F.L.S., Government Botanist; and J. R. Tovey, Herbarium Assistant.

The African Box-thorn.

Lycium horridum, Thunberg, *Solanaceæ*.

A shrub growing to a height of twelve feet. Stem, stiff, much branched; branches, grey, ending in a spine; leaves, obovate, fleshy, glabrous, in tufts of three to seven, flat above, convex beneath. Flowers, single on a short stalk. Corolla white, or tinged with purple. Fruit, a berry, globe-shaped, orange-red.

This spring hedge-plant is very variable in height, and being perennial, is difficult to eradicate. It should be dug up before flowering and burnt.

An introduction from South Africa.

Proclaimed for the whole State, April, 1907.

PLATE 19

J. R. Torey, Direxit.

ORCHARD PESTS AND DISEASES.

Short Instructions to Fruit-Growers.

A. A. Hammond, Inspector, Vegetation Diseases Acts.

Codlin Moth.

All natural harbors for grubs such as loose bark, dead or broken limbs, old stakes, and props must be removed from trees and burnt not later than 15th September and holes in trunk or limbs must be stopped with putty or other suitable material.

Bandages must be placed on all apple, pear and quince trees not later than 1st December and should be removed and cleansed weekly till 1st May.

All fallen fruit must be gathered and infected fruit picked and destroyed by boiling.

Spray with arsenite of lead when fruit sets and spraying should be repeated sufficiently often to keep fruit protected by mixture whilst it is on the tree. If no rain falls 14 to 21 days may elapse between sprayings. Spraying need not be done after 15th March for late fruits and fourteen days before picking for earlier fruit.

Arsenite of Lead Formula—1 lb. white arsenic, 2 lbs. washing soda, 7 lbs. acetate of lead, 360 gallons water. Directions for preparing stock mixture. Boil arsenic and soda together for 30 minutes in ½ gallon water. Dissolve acetate of lead in 1 gallon of warm water. When cool pour arsenite of soda slowly into acetate of lead solution. Stir and bottle. Use 1 pint to 30 gallons of cold soft water. The mixture should be applied with a fine spray.

San Jose Scale.

Affected trees must be cut well back at pruning and all suckers and prunings burnt. Spray with lime sulphur and salt, or red oil emulsion in winter and give at least two sprayings before buds swell.

Lime Sulphur and Salt Wash Formula.—30 lbs. unslaked lime, 20 lbs. sulphur, 15 lbs. coarse salt, 60 gallons water. Place 10 lbs. of lime and 20 lbs. of sulphur in an *iron* vessel and boil for 1½ hours in 16 gallons of water. Slake remainder of lime with hot water and add salt whilst slaking. Add this to boiling mixture and boil for ½ hour longer. Make up to 60 gallons with fairly hot water. Strain through hessian and apply with coarse nozzle.

Red Oil Emulsion (Winter Strength).—1 gallon red oil, 1 lb. soft 1 lb. soft soap, 14 gallons of water.

Red Oil Emulsion (Summer Strength).—1 gallon red oil, 1 lb. soft soap, 30 to 32 gallons water.

Boil 1 gallon of water and in it dissolve soap. Remove from fire and add oil. Replace on fire and bring to boil, stirring occasionally. Then churn for 5 minutes with a garden syringe or by pumping mixture into itself through nozzle. Make up to required strength with fairly hot water.

Peach Aphis.

Spray with tobacco wash as soon as aphis appears.

Tobacco Wash Formula.—1 lb. waste tobacco, ¼ lb. soft soap, 5 gallons water. Steep tobacco for 24 hours. Heat remainder of water

and in it dissolve soap. Add tobacco water and spray when warm. Note.—Never boil tobacco as the nicotine which is volatile is evaporated.

BLACK SPOT ON APPLE AND PEAR.

Spray with Bordeaux Mixture as leaf buds are opening and again just before flower buds expand.

Bordeaux Mixture Formula.—6 lbs. bluestone, 4 lbs. fresh unslaked lime, 50 gallons of water. Slake lime with small quantity of water and then make up to 25 gallons. Dissolve bluestone in 25 gallons of water. Run evenly into third vessel through strainer. Stir well and apply with fine spray.

LEAF CURL OF PEACH.

Spray with Bordeaux Mixture, double strength (6.4.25 formula) about 1st August and again *before* buds open with 6.4.50 formula.

APRICOT SCAB.

Spray as directed for leaf curl of peach and in bad cases give two sprayings after fruit sets with 6.4.50 formula.

THE FRUIT EXPORT TRADE.

During the past season about 200,000 packages of fresh and dried fruit have been inspected under the Commerce Act.

Subjoined are notes and observations from officers of the staff engaged on the work of inspecting products intended for export as furnished to the Chief Inspector :—

Inspector Meeking writes :—

In reply to your request I have the honour to submit notes and observations on the work performed by me under the Commerce Act from 1st October, 1906, to 30th June, 1907.

When the Commerce Act came into operation last year the fruit export season to the United Kingdom and Europe had finished. The busiest period of the export trade to New Zealand was just about to start and it was in connexion with this that most of the work under the new Act commenced. All exporters concerned in the above-mentioned trade cheerfully complied with the regulations. A few hitches occurred at the outset regarding early notification of the office in connexion with intending shipments but these soon lessened and eventually ceased. The fruit exported to New Zealand was mostly of uniform excellence both in respect of soundness and general quality. The shippers engaged in this trade exercised much care in the selection of their products. Much of the fruits sent to New Zealand, notably cherries, is shipped direct by growers. The manner in which some of these products are put up reflects great credit to the senders. The work in connexion with the inspection of fruits shipped at Port Melbourne and Williamstown for export to the United Kingdom and Europe, owing to the necessary exercise of care in checking trade descriptions &c. was greatly increased. Although the whole of the shipments were handled by this Branch both in regard to the work of tallying

and delivering, as well as of inspection, everything passed off without a hitch and in no instance did any delay occur. The bulk of the products which came under my notice was of good quality, well packed, and put up in conformity with the regulations. The most noticeable fault was the over-use of packing material in the cases. Some of the most successful exporters use no packing whatever, a plan which I consider very good. The inspection of jams and fruits in liquid occupies a great deal of the time of the staff. This work is mostly performed at the various jam factories, &c. The method of inspection is as follows :—The officer opens samples promiscuously to see that no fermentation is present, the cans containing the goods are closely inspected for leakages and also weighed to see that they are of the weight specified on the label. No samples have been submitted for analysis as a standard has not been provided for these goods in the regulations. I am of opinion that if such were done the quality of these products would be benefited and the work of the inspectors strengthened. I think also that provision should be made for grading green fruits and that a scale of classification should be included in the regulations. The work allotted me in assisting you in the supervision of the duties of the staff has been rendered lighter than it would otherwise have been owing to the willingness of all the officers to carry out their duties promptly with as great a regard to the interests of trade as is consonant with the performance of strict duty."

Inspector Cleland :—" I beg to report, regarding my work under the Commerce Act, that although this measure was an entirely new departure and was viewed with alarm in many quarters prior to its inception little or no friction has occurred between the exporters and the officers of this Branch, despite the fact that this has been the heaviest export season to date. All the apples and pears which were exported beyond the Commonwealth were, with few exceptions, of excellent quality and of the full weight and size as required by the regulations. Our work was rendered much heavier owing to the additional duties which we were called upon to perform in measuring and weighing cases and in checking trade descriptions. Although the new Fruit Cases Act did not come into operation sufficiently early in the season to influence the export trade in a legal sense, most of the exporters put up their products in compliance with its provisions and used the cases specified in the schedules of that measure."

Inspector Mallett :—" I beg to report that from the 1st October 1906 I have been engaged on the examination of shipments of fresh, dried, and canned fruits for export under the Commerce Act. The fresh fruits, with few exceptions, were of a very high grade and mostly free from disease. The principal disease noted in those apples which were rejected was 'bitter-pit.' Some of the exporters however, have a good deal to learn as to the general "get-up' of the cases. Some of these are constructed of rough timber with paper labels pasted on them with the details written in pencil or ink. These labels are liable to be washed or blown off and would suggest that the 'trade description' be neatly stencilled on in future. I have noticed also that in connexion with the export trade to New Zealand the use of second-hand cases is very prevalent. Many of these cases are so black with use and old age that the brands are scarcely visible. This is a very reprehensible practice, but its continuance should cease with the application of the provisions of the new Fruit Cases Act. Regarding the fruit, I notice there is room for improvement in the grading and packing, some cases being packed very loosely."

Inspector W. H. G. Keys:—"My appointment as an Inspector under the Commerce Act being contemporaneous with the opening of the export season to Europe only I cannot report as to the condition &c. of fruits exported prior to that time. Regarding my work of inspection in connexion with the above-mentioned season I have the honour to report that as the task of handling shipments was wholly taken over by the Department this season much extra labour thereby devolved upon the staff. The work was so heavy as to oftentimes necessitate the attendance of the staff for 50 hours without a break. Much of this occurred through the inadvertence of the consignors loading consignments of pears and apples promiscuously in the same truck. In other instances again, consignments belonging to two, three, or more senders would be mixed indiscriminately in the trucks. This necessitated unloading these trucks and shifting the consignments in order to check the quantity stated on the way-bills. The trucks provided were also in many cases unfit for the carriage of perishable produce. Instead of forwarding consignments in the 'U' louvre truck these were often sent in open 'I' trucks with merely a tarpaulin thrown over ostensibly to keep out wet. They did not even answer this purpose effectually in every instance as cases often occurred in which consignments arrived in trucks with water covering the floor owing to the unsound condition of the tarpaulins. In hot weather moreover the temperature under these coverings in the truck often exceeded 120 degrees."

Inspector Cole:—"I have the honour to submit my report concerning work done by me under the Commerce Act. Regarding the fresh fruits, the chief fault I have noticed is in connexion with the packing. Much of this has been loosely done and more apples could often have been put in the cases. In other respects the products have been up to the requirements. Concerning dried fruits it would be well for exporters to note that many of the cases are too fragile and the wood too brittle. Some of the cases arrive at the port of export with half the covering lid missing. This of course is attended to when practicable by the coopers attached to our staff. The spaces moreover, between the slats are often too wide and allow the dirt to fall through to the detriment of the fruit. Jams and fruits in liquid have been put up in much stronger packages than those above-mentioned and have been packed and marked in accordance with the Commerce Act."

GARDEN NOTES.

J. Cronin, Inspector, Vegetation Diseases Acts.

The Amaryllis.

Amaryllis is a genus of deciduous bulbous plants found native in South Africa, consisting of a single species, *A. belladonna*, of which there are several varieties. The genus at one time included plants now known under the names of *Vallota, Sprekelia, Zephyranthes*, and *Hippeastrum*, the last mentioned being still included in *Amaryllis* in many garden and trade collections. Amaryllis belladonna—the Belladonna lily and its varieties—produces its blooms without foliage during summer and autumn, the leaves developing after the flowers die. The growth of foliage continues throughout winter and spring, the foliage dying and the bulbs resting during the greater part of summer. Hippeastrums are natives of Brazil

and other parts of tropical South America, and the islands adjacent, and vary greatly from Amaryllis in the production of their flowers, and the flowers also, which develop with the foliage during spring and summer, the bulb resting during winter. Hippeastrums have been greatly improved by horticulturists, various species being hybridized with success. The hybrids are far superior to the original types in size of flowers, range of colour, and form. Sprekelia is also a native of tropical South America. The only species cultivated in our gardens is *S. formosissima* which bears singular but beautiful flowers of a bright crimson colour. Vallota *purpurea*, a native of South Africa, flowers during autumn, and is one of the most beautiful of bulbous plants, the blooms being large, cup-shaped, and of a brilliant scarlet shade of colour. *Zephyranthes* are small, bulbous, plants,

HIPPEASTRUM HYBRID.

AMARYLLIS BELLADONNA, MAJOR.

producing white and pink flowers. The whole of these are hardy plants in the greater part of this State, and may be grown successfully in most of our gardens.

CULTURE.

Amaryllis belladonna is probably the hardiest bulbous plant cultivated in Victoria. It requires an open position and good drainage and under such conditions it will thrive in most soils with a minimum of attention. It is a splendid subject for large dry borders, producing its delicate pink flowers, which are borne in umbels on long stiff stems, freely for several years without special assistance. Bulbs should be planted during summer at a depth of about six inches below the surface in unmanured soil. They are most effective when planted in patches containing many bulbs, which should not be disturbed for several years except for the purposes of increase which is effected by offsets from the large bulbs. The bulbs should be planted sufficiently apart to provide for increase, about six inches being enough. There are several fine forms of the belladonna lily including A. blanda and Baptisti, white; magnifica, major, rubra, multiflora, and purpurea, of various shades of rose and purple. These are scarce, and fairly expensive, and usually receive much more care and attention than the ordinary type, though requiring practically the same treatment.

Hippeastrums are magnificent plants for the borders, requiring a sunny position and well-drained soil of rather light texture. Unless the soil is very poor no manure is needed, and even in poor sandy soils an admixture of clay or strong loam is preferable. If manure is added to the soil it should be thoroughly decayed cow manure, and should not come into contact with the bulbs. Planting should take place during late autumn or winter, the proper depth to plant being that occupied by the bulbs before removal viz.:—The crown or neck of the bulb showing at the level of the surface. Hippeastrums require fairly moist conditions during the season of active growth, and as little water as possible when at rest. They are admirable subjects for pot culture, some fine specimens being occasionally seen at horticultural meetings. An evergreen species *H. reticulatum* bears foliage striped with white in the centre, and flowers of shades of pink. Several fine hybrids have been raised between this and other species, retaining most of the characteristics of reticulatum. In most of the local nursery and seed catalogues hippeastrums are referred to as Amaryllis hybrids, some of the finest varieties being comparatively rare and expensive.

Vallota purpurea requires almost identical treatment with hippeastrums, and is specially suited for pot culture. Several bulbs should be grown in a fairly large pot in well drained loamy soil. They should remain undisturbed until the pot becomes too small owing to the increase of bulbs. Over-potting and disturbance are the most general causes of their failure to bloom. The soil should never be allowed to become dry. Bulbs of vallota are plentiful and fairly cheap.

Zephyranthes require a moister situation than the hippeastrums, otherwise the culture is practically identical. Z. carinata is one of the best kinds.

Flower Garden.

The rainfall of early November should insure a fair amount of spring growth where the surface soil was cultivated before it dried, as frequently advised in these notes. Frequent light cultivation will keep the soil in a condition tending to the maturation of such wood growth. In many gardens the plants are prevented from producing ripened growths and perfect flowers by being incessantly watered during the whole of the summer months. Such watering causes a forced growth from buds that normally would remain quiescent during the greater part of summer, and would have steadily developed and produced fine bloom in season, while the soft forced growths are usually destroyed by the great heat and hot drying winds of summer. Roses are often treated thus, instead of being allowed to assume a state of comparative rest during January and February, after which, if lightly pruned and thinned, and thoroughly watered the teas and hybrid teas will develop growths that will produce an abundant supply of flowers, fine in character. Newly planted roses, and other plants and shrubs, not thoroughly established, require watering during summer, as also do such plants as phloxes, bouvardias and others that normally produce their flowers at that time.

Thrips caused the destruction of most of the light coloured roses in the metropolitan district this spring. For the past three years this destructive pest has attacked all flowers developing during the greater part of October and the whole of November and has completely spoiled most of them. It is responsible too for the partial failure of the fruit crop this season, despite the application of various insecticides. Many devices and means are employed by growers of roses for exhibition to save their blooms from

the pest with but little beneficial result. The insects are beyond the reach of spray washes generally, and there seems to be no way to deal with them successfully when the conditions suit them. The most promising of many washes tried this season is "Soaperine," a locally prepared mixture containing a large proportion of soft soap. This was fairly beneficial when applied before the blooms were opening, destroying any insects within reach. As a preliminary to any application of spray washes, all infested flowers and buds, should be cut, and immediately covered with boiling water, or burned.

Beds for the reception of dahlias intended for the production of blooms for autumn exhibition should receive a final digging or hoeing now. If the ground was deeply worked and manured earlier, a light stirring of the surface will be sufficient; if not, a moderate dressing of rotted stable manure should be thoroughly mixed with the soil to a depth of about 2 feet. Light sandy soils should be thoroughly trodden before planting, especially if they contain, as they should, a fair proportion of manure. If the soil is too free and open a coarse heavy growth will follow with flowers lacking quality. Dahlias require a fair amount of room, and when grown in beds should be planted in rows three to four feet apart, with two to three feet between the plants. When planting dahlias from pots care should be taken that the ball of soil is not broken by the removal, a likely contingency if the soil in the pots is dry. The plants should be thoroughly watered an hour before planting is attempted, when a sharp rap on the edge of the pot, held inverted, will detach the plant without disturbing the soil. Plants should be set out slightly below the surface level, and sufficiently watered to moisten the soil thoroughly. Tender plants should be shaded from hot sunshine for a few days. The last fortnight in December is usually selected for planting dahlias for autumn exhibition in the metropolitan district. Divisions of crowns are equal to green plants for all purposes.

Chrysanthemums should be staked and the growths supported as they progress. The shoots should be reduced to four or five at most if large blooms are desired. Any lateral growths or suckers occurring should be removed. Artificial watering will not be necessary at this stage, unless the soil is of a very dry nature.

Daffodils require to be replanted in fresh soil occasionally. Three years are considered long enough for the bulbs to occupy a bed or patch. The bulbs may be lifted after the death of the foliage, and be immediately replanted, or dried and stored until February. Ground for the reception of the bulbs later should be prepared soon. In very poor dry soils a dressing of cow manure may be dug deeply into the beds or patches, and a little bone-dust worked through the soil nearer the surface.

Annual and biennial plants approaching the blooming stage should receive sufficient water to thoroughly moisten the soil during dry weather. Bulbs of gladioli may be planted for late summer flowering. They require deeply worked and well enriched soil to produce good flowers.

Kitchen Garden.

Ground should be prepared for future cropping as soon as any crop is harvested. A heavy dressing of stable manure should be worked into the soil, and the surface be rolled or trodden firmly. In addition if the ground is not required for cropping at once, ordinary surface cultivation

should be carried out. Any moisture in the soil or manure will be conserved and the soil be in a condition of fine tilth when required.

Succession crops of French beans and peas and various saladings should be provided. Seeds of beans and peas should be sown at this season in shallow trenches, in thoroughly moistened soil. A light mulching placed in the trench is decidedly beneficial to the plants, and diminishes the need of watering, in addition to neutralizing the action of the hot sunshine on the soil.

Tomatoes should be tied to stakes or other support as growth advances, and all lateral shoots regularly removed from the selected shoot or shoots. Two shoots to each plant is considered sufficient. Where the fruit has set well the plants will need a fair supply of water, but where large gross growths and foliage are the only produce of the plants, water should be withheld.

SAND MOUNDS ON LAWNS.

Mr. T. W. Pockett, Head Gardener to the Malvern Town Council, writes as follows:—

"For several years during spring and autumn, particularly the latter, many people have complained about sand mounds suddenly appearing on their lawns. Some thought they were caused by caterpillars or grubs. I attributed the cause to a black beetle—about 2½ inches long when full grown. About two years ago, after considerable trouble I managed to trace a few by following the holes made by them. Mr. C. French, Government Entomologist, was also satisified that the beetle referred to was the cause of the trouble.

Knowing that this beetle is not to be found in any lawns where the soil is retentive, and that a very stiff soil, or clay added to lawns as top-dressing, is very beneficial for a deep sandy soil, caused me to try the experiment for the purpose of both. The result has been highly satisfactory. No beetles have appeared where the lawn has been treated with about 2 inches of clay, and the lawns being composed of Kentucky blue grass, and buffalo mixed, there was a good turf a few weeks after. This season I have just covered about 2 chains more with clay, and shall be pleased to give the result later on, but anticipate that this also will be immune from the pest.

Where the beetles exist, they appear to lay their eggs (at least I take them to be eggs) on the leaves of the grass on damp dewy nights about the end of October or early in November. The eggs are quite round, nearly the size of turnip seed, and are mostly rather dark. I think there are from 200 to 500 eggs in each patch, which is about 3 inches in diameter."

RHUBARB CULTIVATION.

J. Cronin, Inspector, Vegetation Diseases Acts.

Rhubarb is the most important and popular perennial vegetable cultivated in Victoria. A considerable quantity is consumed at certain periods of the year, and since the introduction of the variety Topp's Winter—a practically evergreen type—supplies are available if required at all seasons. The area of land devoted to rhubarb culture for market has decreased during the past ten years, the increased supply of early fruits being responsible for the decrease.

The greatest demand exists in spring, before the gooseberries and other fruits suitable for culinary purposes similar to rhubarb are brought to the markets, and during which period the finest rhubarb is produced. It is estimated by officials of the Market Gardeners' Association that during the period from late September to end of November from four to five thousand dozen bunches per week are offered and readily sold in the markets from which the supply of Melbourne and suburbs, and some country towns, is distributed. At other seasons the demand is limited, except when a scarcity of fruit occurs. The average price for the whole year is estimated at nine pence to one shilling per dozen bunches, so that the revenue derived from rhubarb culture is large, considering the limited area under the crop. Unfortunately, there is no market outside this State for rhubarb, the rapidity with which it loses its moisture and crispness, the factors that make up quality, militating against its long carriage. The limit of successful carriage of rhubarb is about 100 miles, and even then it often arrives in poor condition in warm weather.

The greater part of the rhubarb offered for sale in the Melbourne markets is grown in the shire of Moorabbin, the principal gardens producing it being situated at and near East Brighton. Smaller quantities are grown at Ballarat, Bendigo, and Warragul, from which districts in times of scarcity in Melbourne supplies are drawn; while market gardens near important towns in many parts of the State produce sufficient for local requirements.

The present garden varieties of rhubarb are a great improvement on the original species, *Rheum Rhaponticum*, a native of Eastern Asia; the improvement having been effected by culture and selection, and also intercrossing with other species.

SOIL SUITABLE FOR RHUBARB.

The soil at East Brighton is a deep sandy loam, and is eminently suitable for the plant. Strong, retentive, or shallow soils, or soils such as the deep porous loams of some of the hilly districts, where the soil moisture is soon lost are not suited to the needs of this plant, unless considerably ameliorated by the addition of large quantities of stable manure in the case of the latter, and deep trenching, draining, and manuring, in the former—operations too costly for the profitable culture of rhubarb for sale. For home use almost any soil can be prepared to grow a supply, a small bed of plants being sufficient for the needs of an average household. The object of the cultivator should be to produce large, juicy, leaf-stalks, and to that end a fairly open deep rich and well-drained soil is a necessity.

MANURING—PREPARATION—PLANTING.

Stable manure is undoubtedly the best fertilising agent for any plant requiring a deal of moisture and plant food for the production of large foliage. In preparing land for rhubarb a liberal dressing of partly decayed stable manure should be worked into the soil some time before planting. There is little danger of over-manuring dry and poor soils for rhubarb. It is important that the preparation should be thorough, as a bed or plantation well prepared should last for many years in full profit, if treated in a proper manner. After the plants are established annual dressings of stable manure in autumn are necessary, to which artificial manures may be added, or be lightly worked into the surface soil at end of winter. Blood manure and bone-dust are popular fertilizers in the district where the plant is most extensively grown for sale purposes, being applied in July and lightly ploughed into the soil.

Rhubarb is propagated from divisions of the crowns and from seeds. Seedlings vary considerably, many being very inferior, and are not worth raising unless new varieties are aimed at. A piece of root with one eye or bud attached is sufficient to produce a good strong plant. These divisions should be planted in autumn before the soil becomes cold, at a depth of about three inches below the surface. The best plan is to plant in rows about four to five feet apart, allowing from three to four feet for each plant in the rows. The soil may be worked into narrow lands or ridged along each row of plants. Either method assists in gathering the crop and also insures drainage of excessive surface moisture. During summer the soil should be kept in a loose fine condition at the surface, or in heavy soils mulched with stable manure, &c. The mulching may be worked into the soil during May, at which time the plants are at rest. An open situation is necessary.

GATHERING AND BEST VARIETIES.

The plants are fit to "pull" during the second season of growth, if strong and large. Usually a fair crop of stalks is available during the third year, only the largest and best stalks being pulled. The leaves are pulled, and detach readily at the point of insertion on the crowns. All small leaves should be allowed to remain to exercise ordinary leaf functions, and after the spring season the whole of foliage should be allowed to grow, except on very strong plants, or where they are becoming crowded. The crop of a future season depends largely on strong leaf growth during summer. Weakly plants should not be pulled, and flower stalks should be destroyed as they appear, to conserve the energy of the plants for leaf and root production.

There are several varieties of rhubarb catalogued by nurserymen, but only two are grown generally by market gardeners, viz., Early Albert and Topp's Winter. Early Albert is the finest rhubarb in cultivation here, producing large juicy stalks of good colour. It is also the earliest of the spring rhubarbs, and a vigorous variety. Some of the finest stalks are produced during January, when a reasonable number may be pulled for home use if required. Myatt's Linnæus is the only other summer variety grown by market growers, succeeding "Early Albert," and being of good quality, though deficient in colour. Topp's Winter is also fairly largely grown for sale purposes. It is very hardy and prolific, and requires less room than the other varieties. The stalks are much smaller, but the colour

and quality are good. It is a first rate variety for small gardens, producing leaves for pulling over a long season under fair conditions. A newly distributed variety, Stone's Ever-bearing Ruby, is said to be a cross between Albert and Topp's Winter. It is a very promising variety, producing large highly coloured stalks during a great part of the year.

EXPORT OF VICTORIAN CHEESE.

At the Cheese Competition at the A.N.A. Exhibition held in Melbourne at the beginning of the year a special prize of £10 was given in Class G (1 ton export cheese, not over three months old) for the ton of cheese which would arrive in London in the best condition for the English market, the judging to be done by an English expert. Eighteen out of the twenty-two exhibits were shipped per s.s. *Devon* and duly judged by Mr. A. Rowson of Messrs. Rowson, Hodgson, and Co., Ltd., whose report, received through the Agent-General for Victoria (Hon. J. W. Taverner), is published herewith. An extract from Messrs. C. F. Partington and Co.'s circular is also given. The awards at the Melbourne competition, together with the comments of the judges, are given on page 183 of the March issue of the *Journal*.

Rowson, Hodgson, and Co., Ltd.,
Cotton's Wharf, 35 Tooley-street, S.E.,
31st May, 1907.

Dear Sir,

Having at your request examined 18 lots (1 ton each) Victorian cheese ex s.s. *Devon*, I now beg to enclose my reports as to flavour, texture, colour and finish of the individual parcels, and trust same will be useful for the objects you have in view.

Two lots stand out very much in front of all the others (viz. Nos. 4 and 10) and are certainly more nearly akin to the matured development of the New Zealand production than any of the others.

Flavour.—The flavour appears to have suffered from heat, but whether this was developed at the time of making or afterwards, I cannot say.

Texture.—The texture as a rule is broken, and the cheese would not cut out well on the counter.

Colour.—In a general way there is an absence of defined colouring, in fact, the cheese are entitled to be called pale (not to say white); this remark does not apply to Nos. 4 and 10. When not manufactured without colouring, it is better to aim at a defined colour, which gives the cheese a better chance of selling in competition with New Zealand and Canadian.

Finish.—The finish of the lots as a whole is not smart, the edges being too round, or I may say, not sharp enough.

General Remarks.—The small sizes do not as a rule bring as high a price as the larger sizes, and unless quality is superior to the latter, makers may rely on getting 1s. to 2s. less on the open market. On a scarce or awkward market, many of the foregoing defects are minimized, but on a fairly even or sluggish market they count for a great deal adversely.

If there is anything further you wish to interrogate me upon in connexion with the Victorian cheese, please command my services.

Yours truly,
(Signed) A. ROWSON.

The Agent-General for Victoria,
142 Queen Victoria-street, E.C.

Exhibit No.	Competitor.	Points Awarded.					Judge's Comments.
		Flavour, 50.	Texture, 30.	Colour, 15.	Finish, 5.	Total, 100.	
1	*J. J. Meredith, Larpent*	*40*	*20*	*5*	*3*	*68*	*F. Fair. T. Good. C. Poor. F. Indifferent.*
2	H. Hennessy, Bena	40	15	5	4	64	F. Fair. T. Too rough. C. Undefined. F. Good.
3	D. and J. McRae, Larpent	40	15	5	3	63	F. Fairly good. T. Broken grain. C. Undefined. F. Fair.
4	Cobrico Cheddar Co.	40	25	15	5	85	F. Good, though somewhat advanced. T. Good, close cutting. C. Good and regular. F. Very good.
5	P. Irvine, Orbost	35	15	5	2	57	F. Somewhat heated. T. Broken grain. C. Poor, almost white. F. Poor.
6	McConachy Bros., Cororooke	20	15	5	3	43	F. Rank. T. Fair. C. Indifferent. F. Fairly good.
7	A. McRae, Larpent	30	10	5	3	48	F. Warm. T. Weak body and loose cutting. C. Very irregular. F. Badly finished on edges.
8	Warrnambool Cheese Factory	35	15	10	5	65	F. Very fair. T. Broken curd, irregular. C. Somewhat irregular. F. Very satisfactory.
9	*R. and J. Crothers, Wangoom*	*35*	*20*	*8*	*3*	*66*	*F. Little weedy. T. Good, but open. C. Too pale. F. Very fair.*
10	Noel Bros., Terang	40	25	15	3	83	F. Good. T. Good, somewhat holey. C. Good. F. Very fair.
11	Clachan Dairy, Cororooke	35	20	5	3	63	F. Very fair. T. Very fair, little holey. C. Bad. F. Too round on edges.
12	Upper Maffra Factory	30	15	5	4	54	F. Rank. T. Some soft, some brittle. C. Bad, too pale. F. Fairly good.
13	Sutton Grange Factory	35	15	5	4	59	F. Poor. T. Broken curd. C. Bad, too pale. F. Good.
14	Boisdale Cheese Factory	35	20	10	4	69	F. Strong. T. Very fair. C. Very fair. F. Good.
15	Boisdale Cheese Factory (A)	30	15	10	3	58	F. Strong. T. Some soft, some brittle. C. Regular, but rather pale. F. Fairly good.
16	Boisdale Cheese Factory (B)	30	20	5	3	58	F. Strong. T. Good. C. Undefined. F. Fairly good.
17	Boisdale Cheese Factory (C)	30	15	8	4	57	F. Over ripe. T. Some soft, some brittle. C. Fair. F. Good.
18	Boisdale Cheese Factory (D)	30	15	8	4	57	F. Over ripe. T. Perished; some soft, some brittle. C. Too pale. F. Good.

Wellington Chambers, London Bridge,
London, 30th May, 1907.

AUSTRALIAN CHEESE.

By invitation of the Agent-General for Victoria, Australia, about 18 tons of Victorian cheese just landed ex s.s. *Devon* were inspected by members of the trade on Wednesday 29th inst., at Hay's Wharf, Tooley-street, S.E.

The cheese vary in shape from about 30 to 70 lbs. each and are packed in crates—2, 3, and 4 in a crate. The quality is rich but most of the lots have been *overkept and are flavoury and nearly all have a "twang" peculiar to the district.* They are very slightly coloured, which is a fault, as the trade prefer either white or good colour. The condition shows signs of heat and most of the crates do not fit the cheese, but with care these matters can soon be improved upon.

Owing to the small stocks of cheese here at the moment, and the absence of undergrades these Victorian cheese will probably sell at from 60s. to 64s. per cwt., which is misleading when compared with the price of finest Canadian and New Zealand.

C. F. Partington and Co., Insurance Brokers.

FIFTH CONVENTION OF THE VICTORIAN CHAMBER OF AGRICULTURE, JUNE, 1907.

VI.—SOME LAW (AS IT MORE PARTICULARLY AFFECTS FARMERS).

(*Continued from page 574.*)

J. Weldon Power, Horsham.

TRAVELLING STOCK.

As I understand this matter, the point of view from which it is desired to discuss it is that of the control of travelling stock and the prevention of the practice now so prevalent of droving stock along the roads of the State for the purpose of grazing such stock. The question is a large one, just as large as the nuisance itself, and that is saying a good deal. I must concede at once that existing legislation is in my judgment quite inadequate to keep the nuisance within reasonable limits. Theoretically the existing law is no doubt adequate; at least it is clear enough, but like a great many other things when wrong-doers set themselves to evade the law, the latter will remain a dead letter because of the expense of attempts to enforce it and the uncertainty of being able to prove, up to the standard of proof required by our Criminal Courts, any breaches of the law. The matter in hand, however, does not merely stop with the question of controlling and repressing the nuisance. That is a simple enough matter. Behind this is the question of the nuisance itself, how it comes into existence, why it exists, how it affects the stock producer, and how its abolition will affect him. The main roots of the evil are the dealer without *bonâ fide* pasture, the stock-speculating auctioneer, and the occasional but still existent greedy grazier. Such dealers and speculating auctioneers may be regarded as one root. To eradicate this root is a simple matter and one for the stock-breeders and owners to determine for themselves. The question is, shall the root be eradicated? What is involved in its eradication? The dealer is practically always in the market, always more or less ready to buy, at a price, stock which the stock-owner is for the time being unable to carry. If the dealer be wiped out, stock-owners must be prepared to carry their stock to the legitimate consumer either in the shape of the direct fat-stock market or the direct stores buyer; or, if there be no stores buyer, then to the tallow vats. In favour of the dealers it must be said that they come in handy and relieve the stock-owners of the worry of getting into touch with the direct consumer. The point is reached on a falling market when the stock-owner must reduce his head of stock or get pasture. It seems invariably to happen on such occasions that there is a scarcity of feed in the stock-owner's own district, and the direct stores buyer there, is not out to buy. The owner does not care to take the risk of consigning to distant markets, and he does not like the illegitimate device of putting the stock on the roads on pretence of travelling them to such markets. Here the dealer comes in and takes the stock off the owner's hands—at a price. On the other hand is the price the stock-owner has to pay for this handiness and relief.

Consider the army of dealers and hangers-on that is supported by the margin between the stock-owner's selling price and that paid by the legitimate consumer or purchaser. Consider how on a rising or steady

market the legitimate price is put up by the dealer against the *bonâ fide* stores purchaser. The latter has the cost of his land to clear; the former has the roads for the cost of droving, and we know what that amounts to. Consider the raiding of the roads and the resulting enhanced difficulty for the legitimate stock-owner in getting his stock to distant markets. Consider the "absorption" of stock from the paddocks by the travelling mobs in the hands of unscrupulous men. All that comes out of the stock-owner's pocket. The evil has grown to huge dimensions and is now a serious handicap. Is the game worth the candle? I should say not, but I am not a stock-owner. It seems to me, as an economic proposition, that the results on the average are against the stock-owner. It should be better for the stock-owner to secure legitimate values and face legitimate losses rather than pay for the services of the dealer the price represented by the margin of waste entailed by the support of the army of dealers and hangers-on.

As regards the other root, the "Greedy Grazier." By "Grazier" I do not by any means mean "Squatter." In my experience anyway it is not squatters' sheep that "hog" the roads. But the same remedy that will clear the dealer off the roads will clear the greedy grazier. This remedy would lie in travelling permits. Refuse a travelling permit to a man who has not pasture to which to take his stock or who cannot show that he is consigning stock from his legitimate pasture to *bonâ fide* sale.

If a legitimate stock-owner or breeder be forced to travel stock from a dry district for pasture elsewhere, he should secure his pasture in advance, otherwise he is stealing public grass. If he cannot carry his stock at home and cannot rent pasture abroad, it is a bad position for him, but he is just then holding bad property. In the long run the economy in wiping out the army living on the margins would enable him to pay for legitimate pasture and his position would be better. Next, on a travelling permit, no drover should be allowed to make a contract on the basis of finding feed and be paid for his work at per head of stock delivered. This form of contract, though convenient to the owner in immediate difficulty, sets a premium on raiding roads and "absorbing" stock. The contract should be at daily wages and with obligation to hire feed, and the hire of feed to be paid for spot cash. The drover could be provided with cash or credit. As long as the present droving system of payment by results is allowed the evil will grow. Honest men will be forced by competition down to the standard of the lowest and least scrupulous type of drover or travelling sheep cadger. Inspectors should be empowered to direct that travelling mobs be paddocked forthwith if their condition shows "starving," and failing securing paddocking, then be consigned to the nearest sale yards for prompt sale, with appeal to a Police Magistrate or Senior Inspector or some such officer. All this involves restricting the roads to the legitimate user, with the certain result of the disappearance of the dealer. He exists by reason of the facility obtaining for illegitimate use of the roads. Make the wrongful use of the roads unprofitable and risky, and the illegitimate operator will be closed out, and, to the advantage, to my thinking, in the long run, of the legitimate owner and breeder. The moral is—"You cannot eat your cake and have it." Continue the dealer and you must shut your eyes to grass stealing and road-lifting of stock. If you want relief, give a mandate that the roads shall be kept for their legitimate purposes. Legislation to that end is easy to evolve, but its administration will entail

some expense and a certain amount of trouble in the way of detail to stock-owners when they themselves desire to use the roads.

To discuss amendment of the present legislation before you have decided the important question whether the dealer is to go or to stay is waste of time. This much is certain—you cannot have both the unrestricted but legitimate use of the roads and at the same time the convenient dealer. The two things cannot co-exist. You cannot keep grass and rabbits in the same paddock. Therefore decide the main question and urge the Executive to take action accordingly.

FOUL BROOD OF BEES.

R. Beuhne, President, Victorian Apiarists' Association.

(*Continued from page 666.*)

3. Chemical treatment has been abandoned by most of those who have practised it as unreliable and involving too much labour. It consists in either feeding medicated syrup, fumigating, or leaving some chemical in the hive to evaporate. Medicated syrup is made by adding 1 part of carbolic acid to 600 parts of syrup, made of sugar dissolved in an equal weight of water. The acid should be dissolved in the water before the sugar is added. When salicylic acid is used instead of carbolic, 1 part of the acid is first dissolved in 8 parts of alcohol. This is the stock solution, of which 100 to 120 drops are added to each pint of syrup, and well stirred in before the syrup cools. Formic acid (pure), 1 part is dissolved in 10 parts of water and a teaspoonful added to a quart of syrup.

Before feeding medicated syrup any combs not containing brood are best removed from the hive, placing empty combs next to the brood into which the bees may store the syrup. Besides the amount of labour there are several other drawbacks to feeding medicated syrup. If honey is coming in freely, the bees may refuse to take the syrup, and during a dearth continuous feeding may attract robber bees from other hives which will demoralise the infected colony and perhaps carry disease germs back to their own hive with them. A cure by feeding can only be expected when the outbreak of disease has not long taken place. A colony which has had foul brood for some time is sure to have disease germs in its stores of honey and pollen, perhaps sealed up, and a fresh outbreak may occur any time when these reserved stores are being consumed for brood rearing. Giving medicated food is therefore in most instances only a temporary remedy.

Fumigating a hive is very effective in destroying germs wherever they can be reached by the fumes, but in this instance also the spores in sealed honey and pollen escape destruction. Salicylic acid is the most convenient chemical for this purpose. The hive operated on is set on a framed wire screen to prevent the escape of bees, and small quantities of salicylic acid on a piece of tin placed under the screen are evaporated by means of a small spirit lamp which should be regulated so that the acid is slowly melted and evaporated, not burned, which would destroy its efficacy.

Of the substances placed in the hive to act as a preventative against an outbreak of disease, naphthaline and carbolic acid and tar may be mentioned. A piece of naphthaline, the size of a large pea, is placed in

back corner of the floor of the hive and replaced with a fresh one when it has disappeared. When carbolic acid and tar are used, equal quantities of the acid and Stockholm tar (wood tar) are mixed and placed in a small shallow tin covered with a piece of woollen cloth and put under the frames at the back of the hive. Both these, as well as other remedies of a like nature have however the disadvantage that they taint the honey (for the time being at any rate), and surplus honey from colonies treated could not well be used for human consumption.

The use of chemicals in the treatment or prevention of foul brood involves such a lot of labour and patient attention that in commercial bee-keeping it is almost impracticable. I have not used any drugs for many years, but have dealt with the outbreaks that occur occasionally by elimination, generally known as the starvation method.

In conclusion I should like to point out the most common causes of infection and the spread of foul brood. There is no doubt whatever, that box-hive men, bee hunters and careless or ignorant frame-hive men are responsible for most of the losses brought about by this disease. It is a common practice when box hives are being robbed to leave the dark comb and refuse about or to purposely put it outside for the bees to clean up to save whatever honey may be in it. Now if one of the hives robbed contains foul brood it will probably be spread to all the hives which share in cleaning up; but that is not all, habits of robbing are engendered in the bees and when the supply offered becomes exhausted they will look round for weak colonies to attack. They will find these on a neighbouring farm or in trees in the bush and as diseased colonies become weak and demoralized they are raided and disease carried home. Bee hunters also usually leave refuse about and thus spread infection. Some of the bar frame hive bee-keepers are however by no means blameless; diseased hives, in which all the bees have succumbed are left standing to be cleaned up by other bees. Brood combs possibly containing disease, are extracted and indiscriminately distributed in the apiary and bees allowed access to honey and refuse causing robbing, stinging, general demoralization, and the spread of foul brood. In many countries special laws have been enacted to deal with foul brood, making practices such as those enumerated liable to penalties. In Victoria we have no such law and an apiarist settling in a new locality can do nothing better than deal with the disease as it breaks out in his apiary until, after some years, the sources of infection which surround him become exhausted by the process of the diseased stocks in his neighbourhood being robbed by his bees, the disease brought home and dealt with by him in his own apiary.

SEED TABLE FOR SEEDSMEN, FARMERS, AND MARKET GARDENERS.*

Compiled by Alfred J. Ewart, D. Sc., Ph. D., F.L.S., Government Botanist and Professor of Botany at the Melbourne University.

The following tables give data in regard to the seeds of the more common culinary vegetables and farm seeds, and though taken mainly from European sources should prove of value to Australian seedsmen, horticulturists, and farmers, as well as to the general public, until they can be replaced or modified by data obtained under local conditions. The first column gives the weight of a pint in ounces and the second the number in 1 ounce. It is understood that in all cases the weights are approximate and will be affected by the ripeness of the seed and the amount of moisture they contain. The size of the seed also varies greatly in many varieties of the same plant (haricots, peas, &c.), or in the same form under different conditions of cultivation. The term seed is used in the technical sense, even where the commercial product is really a fruit (celery, parsnip, beet, &c.) The third column gives the number of years during which the percentage of seeds germinating remains more than half what it was when first collected, provided that they are placed under good keeping conditions (dry, cool, dark, well- aired). The fourth column gives the longest time in years during which any seeds remained capable of germination. The sign † means that some of the seeds remained living beyond the number of years given.

Reference No.	Botanical Name.	Common Name.	Weight of 1 pint in ozs.	No. of Seeds in 1 oz.	Duration of Vitality in years. Average over 50 per cent.	Extreme Limit.
1	Agrostis stolonifera, L.	Fiorin	11	70,000	4	8
2	Allium Cepa, L.	Onion	11	7,000	2	7
3	Allium fistulosum, L.	Welsh onion, red	11	8,400	2–3	7
4	Allium fistulosum, L. var.	Welsh onion, white	11	14,000	3	8
5	Allium Porrum, L.	Leek	12	11,200	2	6
6	Anethum graveolens, L.	Dill	7	25,200	3	5
7	Angelica officinalis, Hoffm.	Angelica	3	4,700	1–2	3
8	Anthriscus Cerefolium, Hoffm.	Chervil	8	12,600	2–3	6
9	Apium graveolens, L.	Celery	11	70,000	8	10†
10	Arachis hypogea, L.	Peanut	9	56–84	1	1
11	Arctium majus, Bernh	Giant edible-rooted burdock	14	2,240	5	6
12	Artemisia Absinthium, L.	Wormwood	15	322,000	4	6
13	Artemisia vulgaris, L.	Mugwort	14	224,000	3	5
14	Astragalus hamosus, L.	Worms	5	168–196	3	8
15	Asparagus officinalis, L.	Asparagus	18	1,400	5	8
16	Atriplex hortensis, L.	Mountain spinach	3	7,000	6	7
17	Avena sativa, L.	Oats	10–14	900–1120	2–3	3–6
18	Basella alba, L.	Common white basella	10	980	5	6

* Compiled from Vilmorin-Andrieux's Plantes Potagères, and Nobbe's Samen Kunde, with additional data.

Reference No.	Botanical Name.	Common Name.	Weight of 1 pint in ozs.	No. of Seeds in 1 oz.	Duration of Vitality in years.	
					Average over 50 per cent.	Extreme Limit.
19	Benincasa cerifera, Savi.	Wax-gourd ..	7	588	10	10†
20	Beta vulgaris, L. ..	Beet	5	1,400	6	10†
21	*Blitum capitatum, L.* ..	*Strawberry Blitum*	18	140,000		
22	Borago officinalis, L. ..	Borage	11	1,820	8	10†
23	Brassica alba, Boiss. (See *Sinapis alba*)	White mustard ..	17	5,600	4	10†
24	Brassica campestris Napo-Brassica, D.C.	Swede	15	10,500	5	10
25	Brassica Caulo-rapa, D.C.	Kohl-rabi ..	15	8,400	5	10
26	Brassica chinensis, L. ..	Chinese cabbage ..	15	9,800	5	9
27	Brassica juncea, Cass. ..	Chinese large-leaved mustard	14	18,200	4	8
28	Brassica Napus, L. ..	Turnip	15	12,600 – 19,600	5	10†
29	Brassica nigra, Koch. ..	Black mustard ..	15	19,600	4	10
30	Brassica oleracea, L. ..	Cabbage	15	8,960	5	10
31	Brassica oleracea acephala, D.C.	Borecole	15	8,400	5	10
32	Brassica oleracea Botrytis, D.C.	Cauliflower ..	15	15,400	5	10
33	Bunias orientalis, L. ..	Hill mustard ..	11	980–1120	3	6
34	Campanula Rapunculus, L.	Rampion.. ..	15	700,000	4	8
35	Cannabis sativa, L. ..	Hemp	10	1,850	2–3	3–5
36	Capparis spinosa, L. ..	Caper tree ..	10	4,480		
37	*Capsicum annuum, L.* ..	*Capsicum* ..	10	4,200	4	7
38	Cardamine pratensis, L.	Cuckoo-flower ..	13	42,000	4	
39	Carum Carvi, L. ..	Common carraway	9	9,800	3	4
40	Chærophyllum bulbosum, L.	Tuberous chervil ..	12	12,600	1	1
41	Chenopodium Bonus-Henricus, L.	Goosefoot ..	14	12,000	3	5
42	*Chenopodium Quinoa, Willd.*	White quinoa ..	15	14,000	4	5
43	Cicer arietinum, L. ..	Chick pea ..	17	84	3	8
44	Cichorium Endivia, L.	Endive	8	16,800	10	10†
45	Cichorium Intybus ..	Common chicory ..	9	19,600	8	10†
46	Cirsium oleraceum ..	Meadow cabbage ..	7	14,000	6	
47	Claytonia perfoliata, Don.	Cuban winter purslane	15	61,000	5	7
48	Cochlearia officinalis, L.	Scurvy grass ..	13	42,000–50,000	4	7
49	Corchorus olitorius, L.	Bristly-leaved corchorus	14	12,000	5	10
50	Coriandrum sativum, L.	Coriander ..	7	2,500	6	8
51	*Crambe maritima, L.* ..	*Sea-kale*	5	420–500	1	7
52	*Crithmum maritimum, L.*	*Samphire* ..	3	9,800	1	3
53	Cucumis Anguria, L. ..	West India gherkin	12	3,600	6	7†
54	Cucumis citrullus, Ser.	Watermelon ..	10	140–160	5	10†
55	Cucumis colocynthus, L.	Fancy gourd ..	10	560	6	10†
56	Cucumis melo, var. flexuosus, L.	Snake cucumber ..	10	1,120	7–8	10†
57	Cucumis melo, L. ..	*Melon*	8	980	5	10†
58	Cucumis prophetarum, L.	Prophets cucumber	11	3,200	6	
59	Cucumis sativus, L. ..	Cucumber ..	11	980	10	10†

Reference No.	Botanical Name.	Common Name.	Weight of 1 pint in ozs.	No. of Seeds in 1 oz.	Duration of Vitality in years.	
					Average over 50 per cent.	Extreme Limit.
60	Cucurbita maxima ..	Pumpkin or squash	9	84	6	10†
61	Cucurbita melopepo ..	Custard marrow ..	10	280	6	10†
62	Cucurbita moschata ..	Neapolitan pumpkin or squash	9	196	6	10†
63	Cucurbita pepo ..	Vegetable, green, and custard marrows	10	160–220	6	10†
65	Cuminum cyminum, L.	Cumin	8	7,000	1	5
66	Cynara Cardunculus, L.	Cardoon	14	700	7	9
67	Cynara scolymus, L. ..	Artichoke ..	13	700	6	10†
68	Cyperus rotundus, L. ..	Nut-sedge* ..	13	560–840	3–4	5
69	Daucus carota, L. ..	Carrot, bearded and green spotted	4	19,600	4–5	10
70	Dolichos Lablab, L. ..	Lablab	17	140–182	3	8
71	Eruca sativa, Mill. ..	.. .. ..	15	15,000	4	9
72	Ervum Lens, var. ..	Lentil	16	280–420	4	9
73	Ervum Lens, var. ..	.. .. ..	19	1,120	4	9
74	Ervum Lens, var. ..	.. .. ..	18	980	4	9
75	Ervum *monanthos*, L.	Auvergne lentil ..	18	420–560	3	8†
76	Erysimum præcox, Sm.	American cress ..	12	26,000	3	5
77	Fedia cornucopiæ, Gaertn.	Horn of plenty ..	3	7,000	4	7
78	*Festuca ovina*, L. ..	Sheep's fescue ..	7	15,000–20,000	2–3	4–5
79	Festuca pratenis, Huds.	Meadow fescue ..	8	11,000	2–3	4–5
80	Festuca rubra, L. ..	Red fescue ..	6	18,000	2	3–4
81	Fœniculum dulce, D.C.	Florence fennel ..	7	6,400	4	5†
82	Fœniculum vulgare, Gaertn.	Bitter or common fennel	10	8,600	4	7
83	Fœniculum vulgare, Gaertn. var.	Long sweet fennel..	4	3,500	4	7
84	Fragaria vesca, L. ..	Strawberry ..	13	22,000–70,000	3	6
85	Glycine Soja, Sieb. et Zucc.	China soja bean	16	140–280	2	6
86	Hisbiscus esculentus, L.	Okra	13	420–500	5	10†
87	Holcus lanatus, L. ..	Honey grass ..	11	65,500	4	5–6
88	Hordeum sativum, Pers.	Barley	11–15	700–840	3	4–6
89	Humulus Lupulus, L.	Hop	5	6,400	2	4
90	Hyssopus officinalis, L.	Hyssop	13	23,000	3	5
91	Inula Helenium, L. ..	Elecampane ..	10	14,000	5	6†
92	Lactuca perennis, L. ..	Perennial lettuce ..	6	22,000	3	5
93	Lactuca sativa, L. ..	Lettuce	10	22,000	5	9
94	Lagenaria vulgaris, Ser.	Bottle gourd ..	8	270	6	10†
95	Lathyrus *sativus* L. ..	*Chickling vetch* ..	16	110	5	
96	Lavandula vera D.C. ..	Lavender ..	13	26,000	5	6
97	Lepidium sativum, L. ..	Garden cress ..	16	12,000	5	9
98	*Levisticum officinale*, Koch.	*Lovage*	4	8,400	3	4
99	Linum usitatissimum, L.	Linseed	15	4,400	3–5	5–10
100	*Lotus tetragonolobus*, L.	*Winged pea* ..	18	420–500	5	10†
101	Lycopersicum esculentum, Mill.	Tomato	7	8,400–11,000	4	10–12
102	Malva crispa, L. ..	Curled-leaved mallow	12	8,400	5	8

* Proclaimed for Victoria but often grown in gardens in Europe.

Reference No.	Botanical Name.	Common Name.	Weight of 1 pint in ozs.	No. of Seeds in 1 oz.	Duration of vitality in years.	
					Average over 50 per cent.	Extreme Limit.
103	Marrubium vulgare, L.	Horehound ..	15	28,000	3	6
104	Martynia proboscidea, L.	Unicorn plant ..	7	560	1-2	
105	Medicago scutellata, All.	Snail clover ..	3	110	5	9
106	Melissa officinalis, L. ..	Meliss balm ..	12	56,000	4	7
107	Mesembryanthemum crystallinum, L.	Ice plant.. ..	17	150,000	5	
108	Myrrhis odorata ..	Sweet-scented chervil	5	1,120	1	1
109	Nasturtium officinale, R. Br.	Water cress ..	13	112,000	5	9†
110	*Nigella sativa*, L ..	*Black cumin* ..	12	6,100	3	6
111	Ocimum Basilicum, L.	Large sweet basil	12	22,000	8	10†
112	Ocimum Basilicum, var. *minimum*, L.	Bush basil ..	11	25,000	8	10†
113	Ocimum gratissimum, L.	Tree basil ..	13	42,000	8	10†
114	Oenothera biennis, L.	Evening primrose	8	16,000	3	5
115	Onobrychis Crista-galli, Lamk.	.. .. ..	2	250	5	7
116	Origanum Majorana, L.	Sweet marjoram ..	12	112,000	3	7
117	Origanum vulgare, L. ..	Common marjoram	15	336,000	5	7
118	Paspalum dilatatum, Poiret	.. .. ..	5-6	22,500	3	5†
119	Petroselinum sativum, Hoffm.	Parsley ..	11	16,000	3	9
120	Peucedanum sativum, Benth. & Hook	Parsnip	4	6,100	2	4
121	Phaseolus vulgaris, L. ..	Kidney or French bean	14–19	21–224	3	8–10
122	Phleum pratense, L. ..	Timothy grass ..	13	50,500	4–5	6–8
123	Physalis peruviana, L.	Cape Gooseberry ..	14	28,000	8	10†
124	Picridium vulgare, Desf.	Cultivated sowthistle	5	33,000	5	
125	Pimpinella Anisum, L...	Anise	7	6,400	3	5
126	Pinus sylvestris, L. ..	Pine	11	3,000	3	5
127	*Pisum sativum*, L., var. arvense	*Grey field peas* ..	15–18	140–224	3–4	8
128	Pisum sativum, L. ..	Pea	16–18	110	3–4	8
129	*Plantago Coronopus*, L.	*Buck's horn plantain*	16	112,000	4	9
130	Portulaca oleracea, L. ..	Purslane ..	13	70,000–84,000	7	10†
131	*Poterium Sanguisorba*, L.	Garden burnet ..	6	4,200	2	6
132	Raphanus sativus, L. ..	Radish	15	3,300	5	10†
133	Rheum officinale, L. ..	Rhubarb ..	2–3	980–1,600	3	8
134	Rosmarinus officinalis, L.	Rosemary ..	9	25,000	2	
135	Rumex acetosa, L. ..	Sorrel	14	28,000	2	4
136	Rumex Patientia, L. ..	Patience dock ..	13	12,500	4	6
137	Ruta graveolens, L. ..	Rue	13	14,000	4	6
138	Salvia officinalis, L. ..	Garden sage ..	12	7,000	3	5
139	Salvia Sclarea, L. ..	Clary	14	6,400	3	
140	Satureia hortensis, L. ..	Summer savory ..	12	42,000	3	7
141	Satureia montana, L. ..	Winter savory ..	10	70,000	3	6
142	Scolymus hispanicus, L.	Golden thistle ..	3	8,400	3	7
143	Scorpiurus vermiculata, L.	Caterpillar plant ..	4	84	6	10†
144	Scorpiurus muricata, L.	Caterpillar plant ..	4	160	6	10†
145	Scorzonera hispanica, L.	Scorzonera ..	6	2,500	2	7
146	Secale cereale, L. ..	Rye	13–17	1,280–2,000	2–3	4–6

Reference No.	Botanical Name.	Common Name.	Weight of 1 pint in ozs.	No. of Seeds in 1 oz.	Duration of Vitality in years.	
					Average over 50 per cent.	Extreme Limit.
147	Sinapis alba, L. ..	Mustard	19	4,500–5,600	4	8–10
148	Sium Sisarum, L. ..	Skirret	9	16,800	3	4
149	Solanum Melongena L.	Egg plant ..	11	7,000	6	10
150	Solanum nigrum, L. ..	Nightshade ..	15	14,000	5	8
151	*Spilanthes acmella, Murr.*	*Para cress* ..	4	95,000	5	7†
152	Spinacia oleracea, L. ..	Spinach	8	2,500	5	7
153	Spinacia oleracea, B.L.	Round spinach ..	11	3,000	5	7
154	Tanacetum vulgare, L.	Tansy	7	196,000	2	4
155	*Taraxacum* officinale, Weber	Dandelion ..	6	25,000–47,000	2	5
156	Tetragonia expansa, Murr.	New Zealand spinach	7	280–330	4	8
157	Thymus vulgaris, L. ..	French thyme ..	15	168,000	3	7
158	Tragopogon porrifolius, L.	Salsify	5	2,800	2	8
159	Trapa natans, L. ..	Water chestnut ..	11	2,800	1	1
160	Trifolium pratense and repens	Clover	18	15,500	3–5	5–10†
161	Triticum vulgare, L. ..	Winter wheat ..	12–20	840–2,000	3–5	5–10
162	Tropaeolum majus, L.	Tall nasturtium ..	7	190–220	5	5
163	Tropaeolum minus, L.	Dwarf nasturtium	12	330	5	8
164	Valerianella eriocarpa, Desv.	Italian cornsalad ..	6	28,000	4	
165	Valerianella olitoria, Moench.	Cornsalad ..	6	2,800	5	10
166	Valerianella olitoria, Moench. var.	Large-seeded Dutch cornsalad	5	19,600	5	10†
167	Vicia Faba, L. ..	Broad bean ..	14–17	11–32	6	10†
168	Vicia sativa, L. ..	Vetch	16	300	35	6–10
169	Zea Mays, L.	Sugar maize or sweet corn	14	112–140	2	4
170	Zea Mays, L.	Other varieties ..	13–15	100–150	2–3	10–12

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THE PUMPKIN BEETLE.

(*Aulacophora oliveri.*)

C. French, Jnr., Acting Government Entomologist.

The Pumpkin Beetle is a yellowish insect, about $\frac{1}{4}$ inch long by $\frac{1}{8}$ inch broad, the head and thorax being yellowish and having two black spots on each wing case, the two lower spots being larger than the upper ones. This species (*Aulacophora oliveri*) is also variously known as *A. punctata* and *A. hilaris.* The insect belongs to the Gallerucides, several members of this family being very destructive to various plants and trees; for instance, in America the Elm Leaf Beetle (*Galerucella luteola*) has caused thousands of pounds worth of damage owing to its depredations among the fine elm groves in New York and other places.

During the past month residents in many parts of the State and also in Clare (S.A.) and Corowa (N.S.W.), have forwarded specimens of the beetle, often erroneously called the Ladybird Beetle, and have reported that considerable damage to pumpkins, melons, vegetable marrows, Turks' caps, and cucumber plants was being done by the pest. Nearly every writer states that the beetles suddenly appeared in thousands, eating leaves and flowers of the plants mentioned, and leaving only a piece of stalk in the ground. One grower at Castlemaine stated that he counted fifty beetles on one plant. In December, 1895, we had a similar visitation, and they were also very prevalent in New South Wales, but of recent years they have appeared only in small numbers in isolated places and have caused very little damage. This season unfortunately appears to be a favorable one for insect pests, as the Thrip. and Jassids (small green insects commonly known as froghoppers) have caused considerable damage to late apple crops, raspberries, beans, tomato plants, &c. The Cutworms (*Agrotis*) have also been very destructive to tomato, potato, and other crops.

Inspector Wallis has just reported to me that in the Wangaratta district cherries have also been attacked. As far as I am aware this is the first instance on record where fruit has been attacked by the Pumpkin Beetle.

Among the most effective remedies used against this pest are the following:—

Paris Green.—1 lb. to 200 gallons of water. First mix a little water with the Paris Green to the consistency of thin cream; then pour into the larger quantity of water, constantly stirring to prevent it from settling to the bottom. To insure an even and regular distribution the mixture should be constantly and smartly stirred while being used. It is advisable that the Paris Green should be used in dry weather, so that it may not be washed away before it has time to destroy the beetles.

Kruse's Insecticide.—This is recommended on account of it being fatal to the Pumpkin Beetle in from one to three minutes. It will be found rather an expensive remedy where melons are largely grown, but persons having only a few plants would do well to give it a trial.

White Hellebore.—The proportions of this mixture are one ounce of powder to one or two gallons of water.

Kerosene Emulsion.—Kerosene 2 gallons; or 2 pints; pure dry soap $\frac{1}{2}$ lb.; or 1 oz.; soft water 1 gallon; or 1 pint. Thoroughly dissolve the soap in boiling water and add it while boiling to the kerosene. Churn the mixture violently by means of a force pump or syringe until in 5 or 10 minutes it forms a thick cream-like emulsion, which thickens into a jelly on

cooling and adheres without oiliness to the surface of glass. The agitation must be violent and the hotter the mixture the easier the emulsion is formed. This gives an emulsion of about 65 per cent. strength. For use add one part emulsion to from 4 to 20 parts of water. Four parts of water to one of emulsion is a 13 per cent. kerosene wash, while 20 of water to one of emulsion is approximately a 3 per cent. wash.

Air-slaked Lime.—Dusting the plants with this has proved effectual.

Arsenite of Lead.—The formula used for the destruction of the Codlin Moth has been tried with good results.

THE ORCHARD.

James Lang, Harcourt.

The rains during the past month, though light, have been of inestimable benefit to the fruit crops, and will go a good way towards insuring the fruit growing to a satisfactory size. The unusually dry weather which prevailed in the early part of spring dried up all the moisture in the ground, so that the recent rains were very welcome and saved the situation.

Fruit crops generally are light throughout the State. This is accounted for by the heavy crops of last year, and the prevalence of late frosts in some districts. Cherries are only medium; plums very light in most districts; apricots will on the whole be a good crop, although in some districts they are a failure. Pears will be the lightest crop for many years; Winter Nelis will be a complete failure, but Williams' Bon Chretien will be a medium crop. Peaches are very good in some districts, whilst apples are only a medium crop throughout the State. The season is much earlier than it has been for the past two or three years, cherries ripening over a fortnight earlier than last year, and this will apply to all other fruits as well.

Weeds started by the recent rains should be kept under by means of the scarifier, which should be kept going.

Spraying for the codlin moth should not be neglected. Many growers through press of other work at this season do not spray as regularly as they should. This is a great mistake. In order to get the best results it is advisable that spraying should be done every week until the end of December. Most of the grubs hatch out during the latter part of November and December, and attention to spraying during that period effectually checks the spread of the moth.

Bandaging the trees should also be attended to at once, as the grubs will soon be making their appearance. The bandages should be examined every ten days and all grubs found destroyed.

Woolly aphis is now making its appearance. The trees should be gone over and dressed with the sulphur and potash remedy given in the February number of the *Journal* (page 126).

The season for export will soon be here, and growers who intend shipping should make their arrangements as soon as possible by securing the necessary cool chamber space. There is no alteration in shipping freight this year, but in view of the mail contract entered into with the Orient Company a substantial reduction in freight will be made shortly.

Recently-planted citrus fruits should not be allowed to suffer from the dry weather. A good watering should be given them occasionally to keep them growing.

THE APPLE TRADE WITH GREAT BRITAIN AND GERMANY.

PRICES OBTAINED, 1907 SEASON.

Ernest Meeking, Inspector under the Commerce Act.

The apple export season for 1907 was remarkable not only because the total quantity shipped far exceeded that of any previous year but also on account of the high prices realized on the London and European markets. The lightness of the American apple harvest was partly responsible for this, but the opening up of new markets on the Continent and elsewhere, causing the fruit to be more widely distributed, undoubtedly contributed in bringing about this satisfactory result. This emphasizes the necessity of our fruit exporters giving immediate and close attention to this side of their business and pushing it for all it is worth.

The necessity for this immediate attention may not at first seem very obvious, but it should be considered that the improved methods of harvesting, handling, storing and transporting fruits have of late years considerably lengthened the period over which apples may be kept after harvesting. This is causing the marketing of American apples to extend over a longer time each year. In addition, the areas under cultivation in Cape Colony, Natal and the Argentine are every year on the increase. These countries are situated much closer to the European markets than we are and by reason of their fruit season occurring at the same time of the year as our own, threaten to become serious competitors in the trade. It behoves us therefore to "get on early" and capture as many markets as possible, remembering that the old adage concerning possession applies with equal force to business as it does to law. The principal foreign market patronized by Victorian exporters so far has been Germany. The quantity shipped to that country last season was far in excess of any previous year. The appended list of prices will show that the results well repaid those who were venturesome enough to ship to German ports. That this direct trade might with advantage be established with other continental countries has been clearly proved in the case of America which, within the past few years, has opened up a large and profitable trade with many European ports until recently untouched.

The great drawback to Australia copying this example is the want of a supervising agency to search out new markets, to furnish reports of the coming output and demand (to both growers and buyers) and to control distribution according to requirements. The necessity of cold storage at each distributing centre and an extension of transport facilities to other than the present centres (London and Hamburg) is becoming more pressing year after year; in fact there is, in addition to what is here outlined, many other questions in this connexion which demand urgent attention.

It is unfortunate that for the forthcoming season the Victorian apple crop will probably be a light one, particularly in view of the fact that prices on the London and European markets will doubtless be again high owing to the exceptional lightness of the American crop. Last year the United States and Canadian crops yielded about 75 per cent. of the average. This year according to the latest advices 49 States expect to average only 44 per cent., while Canada, in eight out of the

ten fruit areas, will produce only light to medium crops. Should such results justify this anticipation higher prices even than those obtained last season should be realized.

The list given below may be taken as typical of the prices obtained throughout last season as they are extracted from shipments extending over the whole season commencing with the s.s. *Britannia*, which sailed on 18th February, and ended with s.s. *Omrah*, one of the last boats of the season to take any large quantity.

Vessel.	Date of Sailing.	Destination.	Variety of Fruit.	Highest Price.		Average Price.	
				s.	d.	s.	d.
			Apples.				
Britannia ..	18th Feb.	London ..	Jonathan .. .	18	0	9	6
			Cox's Orange Pippin ..	15	6	10	6
			Cleopatra .. .	15	6	12	0
			King Pippin	15	6	11	6
			Munroe's Favourite ..	14	6	10	3
			Ribston Pippin ..	12	6	9	6
			Reinette de Canada ..	11	6	7	6
			Rome Beauty ..	9	6	9	0
			Bismarck	9	3	8	6
			Pears.				
			Beaujean	11	6	10	11½
			Vicar of Winkfield .	9	0	9	0
			Apples.				
Orontes ..	26th Feb.	London ..	Cox's Orange Pippin ..	17	0	13	4
			Jonathan	16	6	13	0
			Cleopatra	16	0	12	9
			Annie Elizabeth ..	15	6	11	6
			Dumelow's Seedling ..	15	6	13	6
			Ribston Pippin ..	15	0	12	6
			Munroe's Favourite ..	14	0	12	6
			American Pearmain ..	13	6	12	6
			Reinette de Canada ..	12	6	10	5
			Rome Beauty ..	12	0	11	0
			London Pippin ..	12	0	11	6
			Rymer	11	6	11	3
			Pomme de Neige ..	11	6	11	6
			Bismarck	11	0	10	5½
			Gravenstein	10	6	10	1
			Pears.				
			Beaujean	16	0	12	9
			Vicar of Winkfield ..	12	6	10	7
			Beurre Clairgeau ..	6	6	6	6
			Apples.				
Marmora ..	5th March	London ..	Jonathan	15	6	11	6
			Cox's Orange Pippin ..	15	0	14	0
			Cleopatra	15	0	13	6
			London Pippin ..	13	0	12	9
			Annie Elizabeth ..	15	0	11	6
			Munroe's Favourite ..	13	0	11	6
			Rome Beauty ..	9	9	9	3
			Reinette de Canada ..	12	6	10	6
			Esopus Spitzenberg ..	12	0	9	3
			Pears.				
			Vicar of Winkfield ..	8	3	3	4

Vessel.	Date of Sailing.	Destination.	Variety of Fruit.	Highest Price.	Average Price.
				s. d.	s. d.
			Apples.		
Solingen ..	9th March	Germany ..	Jonathan	19 9	13 10
			Munroe's Favourite ..	20 6	16 4
			Cleopatra	19 9	14 8
			Reinette de Canada ..	13 9	11 8
			Rome Beauty ..	12 6	8 1
			London Pippin ..	15 6	10 0
			Apples.		
Sarpedon ..	16th March	London ..	Jonathan	15 6	11 0
			Cleopatra	15 0	13 0
			Munroe's Favourite ..	14 6	12 3
			Scarlet Nonpareil ..	9 3	9 0
			Rome Beauty ..	10 6	9 6
			London Pippin ..	14 0	9 6
			Annie Elizabeth ..	13 6	12 0
			Apples.		
Westphalen	23rd March	Germany ..	Cleopatra	17 6	14 6
			Jonathan	15 9	13 3
			Munroe's Favourite ..	16 6	13 0
			Scarlet Nonpariel ..	9 9	9 0
			Rome Beauty ..	11 3	8 9
			London Pippin ..	16 6	14 0
			Annie Elizabeth ..	15 0	12 9
			Apples.		
Ophir ..	26th March	London ..	Jonathan	15 0	12 3
			London Pippin ..	11 6	10 8
			Cleopatra	14 6	13 0
			Rome Beauty ..	11 0	9 10
			Scarlet Nonpariel ..	11 0	10 9
			Pears.		
			Vicar of Winkfield ..	14 0	11 3
			Winter Nelis	17 6	15 9
			Broom Park	15 6	14 0
			Apples.		
Somerset ..	24th April	London and Germany	Jonathan	5 0	4 3
			Rome Beauty ..	9 6	5 0
			Munroe's Favourite ..	8 6	7 0
			Cleopatra	11 6	7 9
			Scarlet Nonpariel ..	6 6	6 0
			Newtown Pippin ..	10 0	8 8
			Apples.		
Omrah ..	28th April	London ..	Cleopatra	12 6	10 3
			Jonathan	10 0	8 9
			London Pippin ..	10 0	9 0
			Rome Beauty ..	9 0	8 2
			Scarlet Nonpariel ..	9 0	8 3
			Pears.		
			Winter Nelis	22 0	9 4
			L'Inconnue	10 6	9 4

The object of the list is to indicate how the better-known export varieties of apples and pears sell in the different markets at various periods of the export season. It will be noticed that the average embraces a wide range of figures from 4s. 3d. to 16s. for apples and from 3s. 4d. to 22s. 6d. for pears.

The varieties for which the best average prices were obtained were Cleopatra, Munroe's Favourite, Jonathan, Cox's Orange Pippin and London Pippin. The Rome Beauty, although such a favourite export apple, brought on the whole rather disappointing prices. One contributing factor to this unfortunate result was the extreme sappiness of this variety which adversely affected its keeping qualities. The extreme humidity prevailing in many apple-growing localities last season was probably responsible for this so far as the London market was concerned. The chief cause which affected the price on the German market was the distaste which the Germans entertain toward apples possessing such a sweet flavour as the Rome Beauty does. Cleopatra, London Pippin and Jonathan seem to command good figures both in the London and German markets. A noticeable feature is the fine prices obtained for Munroe's Favourite. This apple is justly coming to the fore of late years and is from many points of view a most desirable apple for export, being a good keeper with an attractive appearance and very free from disease. It will be noticed that prices rise from the beginning to the middle of the season and then fall off as the season nears completion.

The prices realized on the German markets have, on the whole, been in advance of those obtained on the London markets. This is probably due to the fact that the quantity sent to the latter exceeds the former out of proportion to their different demands, because the bulk of the Tasmanian fruit is sent to London. Most of the shipment sent in the s.s. *Somerset* went to Germany, being transhipped from London. Of course it is not meant to infer that the prices obtained on the German markets indicate in any manner that those prices would be maintained if much larger quantities were shipped there. Any rash increase would probably mean a big slump in prices. The method of sending fruit in large quantities to markets where good prices have been obtained without fully ascertaining the requirements of those markets has been the *bête noire* of the fruit trade in the past. "First find your markets and their requirements and then supply accordingly" should be the maxim to follow in building up our export trade in fruit.

EXAMINATION OF STALLIONS.

REPORT ON THE VETERINARY EXAMINATION OF STALLIONS FOR THE GOVERNMENT CERTIFICATE OF SOUNDNESS AND APPROVAL.*

S. S. Cameron, M.R.C.V.S., Chief Veterinary Officer.

INITIATION OF SCHEME.

The system was inaugurated to meet in some degree the general demand throughout the State that some measure of control should be exercised over the horsebreeding industry with a view of arresting the generally recognised deterioration that is taking place amongst most classes of Australian horses. A resolution passed by the Chamber of Agriculture at the Sale Convention and conveyed to the Minister on 16th August, 1906, crystallized this general demand into a specific request "to the Minister of Agriculture to arrange on the voluntary request of any Agricultural Society or Parade Council for the free examination for soundness of stallions standing for public service by approved veterinary experts and for the granting of Government Certificates of Soundness." After full consideration of the desirability and practicability of carrying out the suggestion, the Minister decided to adopt it. Accordingly on 24th May, 1907, the following circular was sent to all the Agricultural Societies in the State suggesting the holding of Stallion Parades at which the veterinary examination could be made:—

Department of Agriculture,
Melbourne, 24th May, 1907.

SIR,

In accordance with one of the recommendations of the Chamber of Agriculture, and in pursuance of the policy of assisting the small breeder towards a more valuable result in horsebreeding operations, the Minister of Agriculture (the Hon. George Swinburne) has decided to issue, free of cost, a "Government Certificate of Soundness and Approval" to all stallions standing for public stud service which, on inspection and examination by one of the Government Veterinary Officers, are found free from hereditary unsoundness and defective conformation. The certificates will be given for all breeds—draught horses, light horses and ponies, and it is especially provided that blemishes or unsoundness, or defects of conformation, the result of accident, external injury or overstrain and overwork, will not disqualify.

The main advantage that is expected to accrue from the carrying out of this scheme is that the Government certificate will become the "hall-mark" of soundness in stallions; and owners of mares will be aided in the choice of a sound sire and so be guaranteed that the progeny will not be depreciated in value by the inheritance of unsoundness. Conversely, a means will be afforded of avoiding constitutionally unsound and trashy sires.

The proposal is to have the inspection conducted at parades held at some convenient centre in the different district areas usually travelled by stallions, on some suitable date (whether Show Day or otherwise) prior to the commencement of the forthcoming season—preferably in July or August.

The Minister will be glad if your Society could undertake the arrangements for holding such a parade either alone or in conjunction with other Agricultural Societies in the travelling stud areas of your district. A very sensible arrangement, and one which it is suggested might be adopted with advantage by closely neighbouring

* With the exception of the figures, which have been brought up to date, this report is a copy of a report to the Hon. the Minister of Agriculture, written on 21st October, 1907, as a result of a request in Parliament "for results of the initial examination of stallions to date, together with any evidence that had been forthcoming during the examinations bearing on the question of proof of the hereditary transmissibility of the unsoundnesses held to warrant refusal of the Government certificate." On 21st October, 1907, the report was laid on the table of the House of Legislative Assembly and by vote of Parliament was ordered to be printed.—S.S.C., 30th November, 1907.

societies, has been come to already by three societies in one prominent horse-breeding district. They have agreed to hold the stallion parade in July at their different centres in turn, *so that each centre will have the parade triennially.*

Except to the extent of the announcement and advertisement, the parade and examination will be carried out without expense to your Society and no condition other than those indicated above will be imposed.

I am directed to ask that the matter be laid before your Committee at an early date so that if the parade is decided on, it may be held before the commencement of the stud season and that clashing of dates may be provided against.

I will be glad to receive your reply in due course.

I have the honour to be,

Yours obediently,

(Signed) E. G. DUFFUS,

Secretary for Agriculture.

The Secretary,
Agricultural Society.

It was intended that this scheme if successful might take the place of the various proposals that have at different times been made for the taxation or licensing of stallions, for it was felt that a voluntary system would be more likely to be acceptable to those engaged in the industry than a method involving compulsion. The scheme required for its successful initiation, *firstly*, the support of the stallion owners to the end that a fair proportion of the stallions standing for public service should be submitted for examination and "hall-marked" so to speak; and *secondly*, that breeders or owners of mares should accept the guidance afforded by the certificate and loyally patronize the certificated stallions. Although the past season campaign is not yet completed, sufficient experience of the working of the system has been gained to show that in respect of both these requirements success may be confidently anticipated.

NUMBER OF PARADES AND EXAMINATIONS.

Fifty-six societies in different parts of the State responded to the invitation—many more than was anticipated—and up to the present 49 parades and 29 shows have been dealt with. At these parades and shows a total of 889 stallions have been examined for the Government certificate to date. It may be confidently anticipated that upwards of 900 stallions will have been submitted for examination before the season closes.

This number represents as near as can be estimated between 70 and 80 per cent. of the stallions standing for public use in the State and it is significant of the appreciation with which the scheme is regarded by the horsebreeders of the State that so large a percentage of horses should have been voluntarily submitted for examination during the first season. In districts in which examinations have been made the certificated stallions are dominant and in those of such districts through which I have travelled since the parades, the owners of mares are loyally patronizing the certificated stallions.

DISTRICTS SUPPORTING THE SCHEME.

A return is attached showing (*a*) the centres at which parades have been held. (*b*) the number of horses submitted—draughts, lights and ponies at each centre, (*c*) the numbers in each breed and the total numbers granted certificates and refused certificates and (*d*) the initials of the examining officer. From this it will be seen that the scheme has been strongly supported in the Wimmera, the North-Western, and North-

Eastern districts; and moderately well supported in Gippsland and the Western districts, the only important horsebreeding centre in which the welcome has been equivocal being the northern end of the Goulburn Valley. I am hopeful however that the example set by the enterprising breeders in the Wimmera will be emulated next season by the equally prominent breeders in the Goulburn Valley.

EXAMINING OFFICERS AND RESULTS.

The veterinary officers engaged in this work and the parades and shows they have attended and the number of stallions they have examined with results are set out in the following table:—

—	Parades.	Shows.	Stallions examined.	Certified.	Refused.	Percentages refused.
Mr. S. S. Cameron, M.R.C.V.S., Chief Veterinary Officer ..	16	10	369	270	99	26.82
Mr. W. J. Colebatch, B.Sc., M.R.C.V.S., 1st Assistant Veterinary Officer ..	19	7	283	241	42	14.8
Mr. W. A. N. Robertson, G.M.V.C., Assistant Veterinary Officer	8	8	167	124	43	28.14
Mr. Norman MacDonald, G.M.V.C., Assistant Veterinary Officer	6	4	70	49	21	30.00
Totals	49	29	889	684	205	23.05

HEREDITARY UNSOUNDNESS.

The following ten conditions have been regarded as hereditary unsoundness, the existence of which in any degree would warrant refusal of a Government Certificate:—

- Broken Wind.
- Roaring.
- Cataract (eye).
- Nasal Disease (osteo-porosis).
- Ringbone.
- Sidebone.
- Bone-spavin.
- Bog-spavin.
- Curb.
- Thoroughpin and bursal enlargements.

I have explained elsewhere that an hereditary unsoundness is one in which the tendency to the disease is inherited, and not the disease itself. That is to say, animals with such tendencies will develop such diseases on the incidence of slight exciting causes, whereas in other animals such causes would be ineffective. If such exciting causes are withheld, the hereditarily-disposed animal may escape the affection altogether. When an inherited tendency to disease has not manifested itself by the development of that disease in a given animal, it often happens that in succeeding generations, on the occurrence of influences favorable to the development of the disease, it will be produced. It is frequently observed in regard to such diseases as ringbone that the disease does not occur in the progeny until it reaches the age at which the parent became affected. This may simply mean that similar conditions of life experienced during the same age period, may produce similar results in an animal having a tendency towards such results.

REJECTIONS FOR UNSOUNDNESS.

Of all horses examined 15.17 have been refused certificates on the ground of hereditary unsoundness solely. This percentage is small and shows that our horses compare favorably with those of other countries in respect of hereditary unsoundness. But it must be remembered that in deciding as to rejections the examining officers have been the opposite of drastic in their determinations For instance no horse has been rejected for "founder" (laminitis) although it might be contended that this bane of draught stallions is predisposed to by hereditary influence. Neither have there been any refusals in respect of the first two unsoundnesses on the above list (broken wind and roaring) for the reason that under the circumstances that examination is conducted at Parades there is no opportunity for carrying out the necessary tests.

Of the 889 stallions examined 684 have been given certificates, and 205 have been refused. The percentage of refusals is thus 23.05. Of these 70, or 7.88 per cent. were refused on the ground of their being defective in conformation, nondescript in type, or below a reasonable standard for Government approval—scrubbers in fact of which, it is regrettable to state, a far larger proportion are, in my opinion, not worthy to be certificated. The officers concerned, however, have preferred not to arrogate to themselves the function of judging type, merit and excellence except in the case of those stallions in respect of which it would have been, for them, a matter of shame to have signed a certificate in favour of. The remaining refusals, viz. :—135, or 15.17 per cent., were made on the ground of hereditary unsoundness solely.

As a preliminary to comment on the unsoundnesses met with, it will be instructive to submit the following :—

ANALYSIS OF DEFECTS OF HORSES REFUSED CERTIFICATES.

Defects.	DRAUGHTS.		LIGHTS.		PONIES.		Totals.	
	Number examined—385.		Number examined—297.		Number examined—207.		Number examined—889.	Number Passed—684.
	Number rejected.	Percentage rejected.	Number rejected.	Percentage rejected.	Number rejected.	Percentage rejected.	Number rejected.	Percentage rejected.
Defects of Conformation. Inferior Type, and Under Age	31*	8.05	23	7.73	16**	7.74	70	7.88
Sidebones	80†	20.78	3	1.01	..	..	83	9.36
Ringbones	9‡	2.34	4	1.36	2	.96	15	1.68
Spavin (bone)	3§	.77	14‖	4.70	1	.49	18	2.01
Bog-spavin, Thoroughpin, and Bursal Enlargement	2	.52	4	1.36	..	..	6	.67
Curb	..	..	6¶	2.02	6	2.88	12	1.34
Cataract (Eye)	..	..	..	..	1	.49	1	.11
Totals	125	32.47	54	18.18	26	12.56	205	23.05

* 1 also "Shiverer;" 1 also Bog-spavin. † 2 also "Shiverers."; 5 also affected with Ringbone; 4 with Bog-spavin; 1 with Bog-spavin, Ringbone, and Thoroughpin; and 1 with Curb. ‡ 1 also having Curb. § 1 having Bog-spavin. ‖ 1 having Curb. ¶ 1 having Bog-spavin. ** 1 having Curb.

REJECTION FOR INFERIOR TYPE AND CONFORMATION.

It will be seen from the above table that 7.88 of all horses submitted have been rejected through being below a reasonable standard, so far as conformation and type is concerned, and there is little difference between the percentage of each breed rejected under this head.

Much as I had feared from my previous knowledge that the lamented deterioration of horses in this State arose largely from the inferiority of the sires being used, it has been a matter of surprise to me to find that the nondescript, ill-bred sires predominate in many centres. No matter what the inferiority of the mares may be that are left to us, there can be no doubt that it is the control of the stallions that is the key to amendment of the situation. The mares would indeed have to be wonders to throw anything decent from many of the "scrubber" sires that are standing throughout the State, and that have been proudly submitted to us for Government approval. It must always be remembered that a stallion makes or mars the year's crop of foals, while the mare influences, for good or ill, but one each year.

I would be glad if next season arrangements could be made, whereby the scheme could have the assistance of competent judges to deal more effectively and drastically with this aspect of the subject, for as I have previously indicated the veterinary staff have no desire to undertake functions other than those in regard to which the horsebreeding public have confidence in them as experts.

COMMENT ON DEFECTS FOUND.

Draught Horses.—While the percentage of all round rejections for unsoundness may give room for some congratulation, the percentage of draught sires found to be unsound is a matter that cannot be regarded as other than serious. 32.47 per cent. of the draught stallions examined have been refused certificates. Of these refusals 24.41 per cent. have been for unsoundness.

SIDEBONES.—The bane of draught horses here as elsewhere is sidebone, 20.78 per cent. of all draughts examined having been so affected. Large as this percentage is it compares favorably with the 33 per cent. of sideboned horses found to exist amongst show exhibits in England, when the system of veterinary inspection was first adopted by the Royal Shire Horse Society. It is noticeable that here too, the greater proportion of sidebone is found in the coarse shire type of draught horse as compared with the cleaner boned Clydesdale. One hairy legged brute was come across that had sidebones all round, inside and outside of both fore and both hind feet—8 in all—and being only 3 years old, he was without the usual excuse of the "'ammer, 'ammer, 'ammer on the 'ard 'igh road," or the equally common one of being "trod on in the team."

The belief that sidebones are commonly caused by the coronets being trod on is very general. Perhaps the evidence adduced further on in this report as to its hereditary nature may shake this too common belief in some degree, but it may be here said that the excuse cannot be decently offered in the case of those stallions that are not workers. Furthermore it is a scientific fact that an inflammation of the coronet such as would be produced by tread does not frequently tend to induce ossification of the cartilage of the foot (sidebone). In "quittor," for instance, inflammation of the part may exist for months with actual suppuration in the cartilage without it being transformed into bone.

RINGBONE.—Only nine draughts (2.34 per cent.) have been rejected for ringbone as the sole cause, but six other animals rejected for other unsoundness have also had ringbone (3.89 per cent. altogether).

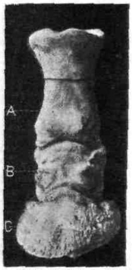


Fig. 1.—Normal Bones of Pastern and Foot. A. Long pastern bone (*Os Suffraginis*). B. Short pastern bone (*Os Coronæ*). C. Pedal or coffin bone (*Os Pedis*).

Fig. 2.—Commencing Stage of Low Ringbone, showing bony roughening on short pastern bone and coffin bone, which may develop so as to ultimately obliterate the coffin joint.

Fig. 3.—Commencing Stage of High Ringbone, showing bony roughening on short and long pastern bones, which may develop and ultimately obliterate the pastern joint.

Fig. 4.—Typical Ringbone (without union of joint), showing ring of diseased bone encircling pastern joint.

Fig. 5.—Typical Ringbone (with union of joint), showing complete stiffening of pastern and coffin joints.

Fig. 6.—Typical Ringbone, showing complete union of pastern and coffin joints, with excessive bony outgrowth.

Other illustrations of ringbone and illustrations of sidebone, bone spavin, bog spavin, thoroughpin and curb have been given throughout the series of articles on Lameness in Horses published in this *Journal* during the current year.

BOG SPAVIN has not been so prolific a cause of rejection as might have been expected, but perhaps in connexion with this unsoundness a greater severity in condemnation may be warranted in future years.

BONE SPAVIN is not a common affection of draught horses, only three cases having been encountered.

Draught horse breeding is at present in a flourishing condition and in some districts the sires used are uniformly high in quality and calculated

to maintain and even improve on the already high standard of excellence to which the Victorian draught horse stock has been brought. Conversely in other districts—notably some parts of Gippsland—there is a great necessity for the introduction of better draught stallions to replace the low-bred mean type at present being largely used.

Light Horses show a much less percentage of rejections for unsoundness, viz., 10.45. The principal unsoundness met with was *Bone Spavin*, fourteen horses (4.70 per cent.) having been rejected on that account. Curb was the next most common unsoundness, six horses having been rejected for this infirmity. *Ringbone* was met with four times and *Sidebone* thrice, while *Bog Spavin* accounted for four other rejections.

Thoroughbred stud-book horses, grade blood horses, and trotters have been included amongst light horses. There are not many of the former being made available at a fee within the reach of the ordinary farmer, only about half-a-dozen such have been met with throughout the campaign. It is the grade blood stallion with a decent pedigree on sire's side only that is most largely used on farmers' mares; and such being the case, the deterioration in light horse stock that has been so marked in recent years is not to be wondered at.

Trotting bred sires are being gradually diffused throughout country districts and many of them are of a type that cannot fail to effect improvement in the matter of bone and substance and harness qualities generally.

Ponies.—It is practically the freedom of ponies from unsoundness that reduces the all round percentage of hereditary unsoundness met with to such favorable proportions. Only 4.82 per cent. of pony stallions have been rejected for unsoundness. As with the other breeds, however, many of the ponies submitted have been nondescripts and 7.74 per cent. have been refused certificates on that account—about the same proportion as in other breeds.

It is refreshing to be able to record that some families of good type ponies have been met with whose prepotency, and whose power for good therefore on the horse stock of the country, is very marked. The "Tam O'Shanter" and "Brigham Young" strain is still prominent in many districts, and representatives of it are almost invariably good and easily identified.

Horse stock of infinitely more value to the country could be bred by the use of these hardy pony sires on farm mares than there are now being thrown by the many weedy light horses that are in use.

EVIDENCE OF HEREDITARY TRANSMISSION OF UNSOUNDNESS.

Some very interesting facts have been brought to light by means of the examination which furnish almost incontestable proof of the hereditary character of some of the unsoundnesses previously set out as warranting refusal of the Government certificate. In the case of sidebone for instance, which is the unsoundness that has accounted for the bulk of the refusals amongst draught horses, convincing evidence of its transmissibility from sire to sons and from sons to grandsons, and so on has been furnished.

Although it was not till about one-third of the parades had been dealt with that this aspect of the matter was given attention, and that pedigrees were taken, at least two instances have been traced of sidebone "running in families." These are so striking and eloquent as to be worthy of record.

In one case twelve male (entire) descendants of one sire have been examined, and all but one of them found to have sidebones.

In the second case ten direct descendants have been examined (nine males (entire) and one female) and of these, eight (seven males and one female) have been found to have sidebones.

These facts may be more clearly represented thus:—

	Examined.		Rejected for Sidebones.
Sire A.	5	Sons	5
	4	Grandsons	4
	3	G. Grandsons	2
Total	12		11
Sire B.	5	Sons	4
	4	Grandsons	3
	1	Granddaughter...	1
Total	10		8

Two of the animals in Family B. were under 3 years at time of examination.

Of the 19 animals rejected as unsound in the two families seven were examined and rejected by myself, four by Mr. Colebatch, five by Mr. Robertson, and three by Mr. MacDonald; and it was not till their pedigrees were traced for the purpose of this report that their relationship was revealed.

If any further evidence was required to demonstrate the hereditary character of sidebone perhaps the most convincing would be the fact that families have been come across in which all the animals examined have been found sound. In one case, a sire and three sons have been examined and all found sound. In another case three sons of the same sire have been found sound, and in a third case only two out of nine descendants examined have had sidebones.

EXAMINATIONS AT SHOWS.

Closely associated with the scheme for the Government certification of stallions have been the efforts of the Department to introduce veterinary examination at Agricultural Shows so that all breeding stock awarded prizes may be relied on as being sound.

Veterinary examination of stallions at Shows was made one of the four conditions, three of which had to be accepted, entitling Agricultural Societies to participate in the Government subsidy. This condition has been accepted by about one-third of the Societies, and in the majority of cases the Government Veterinary Officers have been requisitioned to carry out the examination.

As was inevitable, a certain amount of misconception has existed concerning the innovation, and fears of friction have been entertained, which have militated against the cordial adoption of the condition. But so far no serious hitch has occurred in connexion with the Shows attended by the Departmental veterinary surgeons.

To obviate misconception and to prevent friction next season, and at the same time to consolidate the work of veterinary staff, I am inclined to favour the suggestion that the condition as to soundness of horses at Shows should be so altered as to make the awarding of prizes in stallion

classes conditional on the possession of a Government certificate of soundness. The principle of certification has been so widely accepted, and such a large proportion of the sires of the State is now certified, that with the inevitable extension of the system next year it would be no hardship to demand that all stallions at Shows subsidized by the Government should possess the Government certificate of soundness.

The truth of the statement frequently reiterated by me that it is no uncommon thing for unsound horses to be awarded prizes at Agricultural Shows has been demonstrated during the last fortnight at three shows at least. At two North-Eastern shows the first and second prize stallions had both been previously refused the Government certificate of soundness on account of being unsound from sidebones, and at a Goulburn Valley show the first prize stallion was a recent reject for the Government certificate on account of ringbone.* Hence the necessity of the imposition of a condition bringing all Societies participating in the Government subsidy into line on the point that none but sound stallions shall be awarded prizes at their shows. A show prize would then become what it should be, viz:—a mark of excellence in respect of perhaps the most important attribute of a sire, *i.e.*, soundness.

CONCLUSION.

The contingencies arising in connexion with the initiation of a new scheme such as this, and which has successfully developed in the first season so far beyond anticipations, could not be all foreseen. The experience gained however has been such as to enable me to indicate that before next season the arrangements and conditions in connexion with its continuance can be made much more definite and comprehensive than has been possible this year.

I am desirous of recording my appreciation of the excellent manner in which my efforts towards the initation of the scheme have been seconded by my colleagues on the Veterinary staff, Messrs. W. J. Colebatch, B.Sc., M.R.C.V.S., W. A. N. Robertson, G.M.V.C., and Norman MacDonald, G.M.V.C. They have literally sprung from place to place during the campaign in order that parade appointments might be kept, and it is a great satisfaction for me to know that the confidence reposed in them by the owners of stallions has been, throughout, such as might have been reasonably anticipated from my previous knowledge of their sound practical ability as experts on soundness in horses.

STALLION PARADES AND SHOWS.

RETURN SHOWING NUMBERS OF EACH BREED EXAMINED, CERTIFICATED, AND REJECTED AT DIFFERENT CENTRES.

Place.	Draughts.			Lights.			Ponies.			Totals.			By whom examined.
	Exd.	C.	NC.	Exd.	C.	NC.	Exd.	C.	NC.	Exd.	C.	NC.	
1. Korumburra, 29.9.06..	7	3	4	4	2	2	7	6	1	18	11	7	S.S.C.
,, 18.9·07..	1	1	..	1	1	..	3	3	..	5	5	..	W.J.C.
2. Mirboo North, 25.10.06	5	1	4	4	..	4	5	5	..	14	6	8	S.S.C.
,, 24.9.07	..	..	..	1	1	..	1	1	..	2	2	..	N. McD.
3. Horsham, 18.7.07 ..	11	7	4	4	4	..	3	3	..	18	14	4	S.S.C.
,, Show, 24.9.07	7	5	2	3	3	..	3	3	..	13	11	2	S.S.C.

* Two other instances of like character have since occurred.

STALLION PARADES AND SHOWS—(*continued*).

Place	Draughts.			Lights.			Ponies.			Totals.			By whom examined.
	Exd.	C.	NC.	Exd.	C.	NC.	Exd.	C.	NC.	Exd.	C.	NC.	
4. Dookie, 27.7.07 ..	4	4	..	2	2	..	3	3	..	9	9	..	W.J.C.
5. Traralgon, 31.7.07 ..	9	6	3	2	1	1	6	2	4	17	9	8	S.S.C.
,, Show, 13.11.07	2	2	..	1	1	..	5	3	2	8	6	2	W.R.
6. Hopetoun, 3.8.07 ..	3	2	1	1	..	1	2	2	..	6	4	2	W.J.C.
7. Pyramid Hill, 3.8.07 ..	6	4	2	2	2	..	3	2	1	11	8	3	S.S.C.
,, Show, 23.10.07	3	3	..	5	5	..	..	..	..	8	8	..	W.R.
8. Swan Hill, 7.8.07 ..	5	2	3	8	6	2	2	1	1	15	9	6	W.R.
9. Colac, 7.8.07 ..	7	6	1	8	5	3	8	6	2	23	17	6	S.S.C.
,, Show, 24.10.07	2	1	1	6	5	1	6	6	..	14	12	2	S.S.C.
10. Murtoa, 9.8.07 ..	3	2	1	1	1	..	1	1	..	5	4	1	W.J.C.
,, Show, 27.9.07	1	1	..	2	2	..	..	..	..	3	3	..	S.S.C.
11. Melton, 10.8.07 ..	4	3	1	4	4	..	1	1	..	9	8	1	S.S.C.
12. Donald, 14.8.07 ..	..	..	..	6	6	..	3	3	..	9	9	..	W.J.C.
,, Show, 11.9.07	3	..	3	..	..	..	..	..	..	3	..	3	W.R.
13. Euroa, 14.8.07 ..	7	5	2	8	6	2	2	2	..	17	13	4	S.S.C.
14. Warracknabeal, 14.8.07	2	2	..	5	5	..	3	3	..	10	10	..	W.R.
,, Show, 4.8.07	..	..	..	2	1	1	..	..	..	2	1	1	N.McD.
15. Wangaratta, 15.8.07 ..	12	4	8	18	13	5	5	4	1	35	21	14	S.S.C.
16. Sea Lake, 15.8.07 ..	9	5	4	5	3	2	2	1	1	16	9	7	N.McD.
17. Yarrawonga, 16.8.07	7	5	2	5	4	1	..	..	..	12	9	3	S.S.C.
18. Maffra, 16.8.07 ..	10	8	2	2	1	1	6	5	1	18	14	4	W.J.C.
,, Show, 24.10.07	..	..	..	3	3	..	1	1	..	4	4	..	W.J.C.
19. Benalla, 17.8.07 ..	6	4	2	6	4	2	3	3	..	15	11	4	S.S.C.
20. Hamilton, 17.8.07 ..	8	5	3	4	4	..	4	4	..	16	13	3	W.R.
,, Show, 19.9.07	..	..	..	3	3	..	1	1	..	4	4	..	N.McD.
21. Wycheproof, 20.8.07 ..	3	3	..	4	2	2	1	1	..	8	6	2	W.J.C.
,, Show, 4.10.07	4	4	..	3	2	1	1	..	1	8	6	2	W.R.
22. Minyip, 21.8.07 ..	10	3	7	5	5	..	6	5	1	21	13	8	W.R.
,, Show, 1.10.07	..	..	..	2	2	..	..	..	..	2	2	..	N.McD.
23. Birchip, 21.8.07 ..	10	8	2	3	2	1	1	1	..	14	11	3	W.J.C.
24. Yarram, 21.8.07 ..	4	2	2	5	5	..	4	3	1	13	10	3	N.McD.
,, Show, 20.11.07	2	2	..	..	..	..	1	1	..	3	3	..	W.J.C.
25. Nhill, 21.8.07 ..	17	15	2	7	5	2	5	4	1	29	24	5	S.S.C.
,, Show, 9.10.07	..	..	..	..	..	..	..	..	..	..	..	..	S.S.C.
26. Cobram, 23.8.07 ..	8	6	2	3	2	1	2	2	..	13	10	3	N.McD.
27. Lilydale, 23.8.07 ..	6	6	..	4	3	1	2	2	..	12	11	1	W.J.C.
28. Tatura, 24.8.07 ..	4	3	1	..	..	..	2	2	..	6	5	1	W.R.
29. Shepparton, 24.8.07 ..	10	6	4	11	10	1	1	1	..	22	17	5	S.S.C.
30. Echuca, 24.8.07 ..	7	7	..	6	6	..	1	1	..	14	14	..	W.J.C.
31. Elmore, 26.8.07 ..	7	6	1	7	7	..	2	2	..	16	15	1	W.J.C.
,, Show, 25.9.07	2	1	1	..	..	..	2	2	..	4	3	1	W.R.
32. Kilmore, 27.8.07 ..	7	3	4	3	2	1	..	..	..	10	5	5	S.S.C.
33. Kaniva, 28.8.07 ..	8	4	4	5	4	1	1	1	..	14	9	5	N.McD.
34. Casterton, 28.8.07 ..	6	3	3	4	3	1	6	6	..	16	12	4	W.R.
35. St. Arnaud, 28.8.07 ..	14	10	4	8	7	1	6	5	1	28	22	6	W.J.C.
36. Seymour, 29.8.07 ..	2	1	1	1	1	..	3	3	..	6	5	1	W.J.C.
,, Show, 11.10.07	1	1	..	2	2	..	2	2	..	5	5	..	W.J.C.
37. Mansfield, 30.8.07 ..	9	6	3	8	7	1	3	3	..	20	16	4	W.J.C.
,, Show, 21.11.07	1	1	..	1	..	1	..	..	..	2	1	1	N.McD.
38. Geelong, 31.8.07 ..	12	10	2	8	6	2	10	6	4	30	22	8	S.S.C.
Show, 30.10.07 ..	..	..	..	..	..	..	..	..	..	..	..	..	S.S.C.
39. Warrnambool, 10.9.07	11	7	4	10	8	2	10	8	2	31	23	8	W.J.C.
40. Alexandra, 14.9.07 ..	4	1	3	4	4	..	4	4	..	12	9	3	W.J.C.
,, Show, 14.11.07	1	..	1	..	..	..	..	..	..	1	..	1	N.McD.
41. Morwell, 16.9.07 ..	4	3	1	3	3	..	4	4	..	11	10	1	W.J.C.
42. Stawell, 18.9.07 ..	2	1	1	4	2	2	3	3	..	9	6	3	W.R.
43. Daylesford, 20.9.07 ..	2	2	..	2	1	1	1	1	..	5	4	1	W.J.C.

STALLION PARADES AND SHOWS—(*continued*).

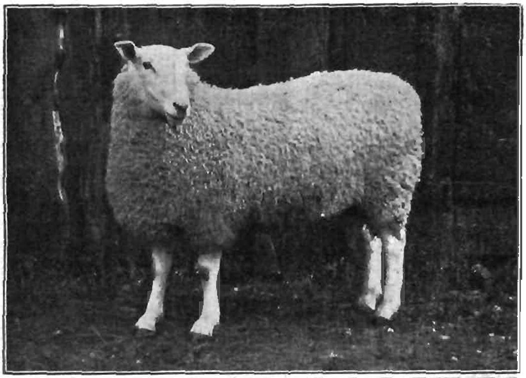
Place.	Draughts.			Lights.			Ponies.			Totals.			By whom examined.
	Exd.	C.	NC.	Exd.	C.	NC.	Exd.	C.	NC.	Exd.	C.	NC.	
44. Rupanyup Show, 20.9 07	3	..	3	1	1	..	2	2	..	6	3	3	W.R.
45. Camperdown, 26.9.07	4	4	..	2	1	1	3	3	..	9	8	1	W.J.C.
46. Kyneton, 26.9.07 ..	11	6	5	7	6	1	3	3	..	21	15	6	W.R.
,, Show, 26.11.07	4	3	1	2	2	..	..	..	..	6	5	1	W.R.
47. Dimboola Show, 11.10.07	2	1	1	1	1	..	2	2	..	5	4	1	S.S.C.
48. Numurkah Show, 9.10.07	5	5	..	2	1	1	2	2	..	9	8	1	W.J.C.
49. Jeparit Show, 16.10.07	5	3	2	4	4	..	1	1	..	10	8	2	W.J.C.
50. Maryborough Show, 16.10.07	7	5	2	4	4	..	3	3	..	14	12	2	S.S.C.
51. Ballarat Show, 17.10.07	5	4	1	13	12	1	8	7	1	26	23	3	S.S.C.
52. Murchison Show, 30.10.07	3	3	..	2	2	..	2	2	..	7	7	..	W.R.
53. Maldon Show, 30.10.07	5	2	3	1	1	..	..	..	..	6	3	3	S.S.C.
54. Sale Show, 31.10.07 ..	3	3	..	..	..	..	..	..	..	3	3	..	W.J.C.
55. Coleraine Show, 6.11.07	1	1	..	1	1	..	2	2	..	4	4	..	W.J.C.
56. Miscellaneous ..	4	3	1	6	6	..	4	4	..	14	13	1	
Totals ..	385	200	125	297	243	54	207	181	26	889	684	205	

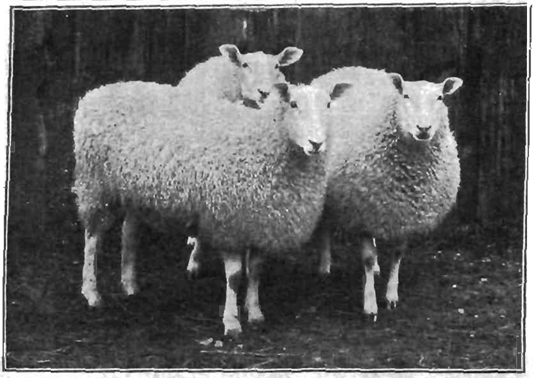
BORDER LEICESTER SHEEP.

H. W. Ham, Sheep Expert.

The Border Leicester is one of the best of our long-wool breeds of sheep, and is a variation in type from the old English Leicester and Lincoln. The breeders of this sheep in the old country have made shape of carcass their principal aim, as seen in the good girths and shapely forequarters in all flocks of any merit. While the Border Leicester has been evolved with these desirable points, breeders have recognised that quality of flesh must be kept in view also; they could see that the coarser the wool fibre, the coarser the grain of flesh below, and so by selection and judicious mating they have brought about a rather finer grade of wool than existed formerly, and with better character also. By encouraging a finer grade of wool and better character in fleece, they have also as a result toned down the coarseness of flesh, and now on all well-bred sheep we find the bright pink skin that is at once an indication of quality of flesh, and upon which, as a general rule, nice wool will grow. A Border Leicester is not, however, a well covered sheep from a wool man's point of view, but the absence of excessive covering is one of the reasons why the breed excels in constitutional points. Had the old breeders made for excessive covering also, they could not have evolved the Border Leicester sheep.

One of the recognised points of the breed as being true to type is, no wool further forward than where the neck joins the head, and to a great degree, in any breed, this really is where the flesh ends. By keeping





SOME RECENT IMPORTATIONS—BORDER LEICESTER RAM AND EWES.

the head and ears clear it increases their comfort, especially towards shearing time in full wool, and when grass seed is bad. The bareness of leg in times of grass seed is an advantage to them. The idea in wool-carrying capacity is to carry as much as possible of a good style of stuff on the

body parts only, and not encourage it on the extremities. In shape of head and ears, they should (in outline only) resemble very much the hare, having clean-cut eyes, bridge of nose, and ears, or in other words, should show a defined well-bred appearance. In colour they should have white faces, ears, and legs, but not the hard kempty white often seen in second rate sheep, and not the slatey blue tinge we see in so-called Border Leicesters with a cross of the other long-wool breeds. A few rich, black spots on ears, and often near the eyes, are not wrong, providing they are not a common dull brown, or dirty black. A rich black spot is called by breeders who have made a success of improving and of individual mating, a "beauty spot." Length of head is a valued point by many Border Leicester men; they consider it gives less trouble in lambing.

Sheep of this breed are good travellers for feed and to water, and stand a lot of hardship. They cross well on merino ewes of a shapely class, and the lambs make good freezers. They are very suitable to graziers who have country suitable for fattening lambs off the natural pasture, and who depend entirely on the season, for if attention is paid that none but shapely good doing rams with fair fleece qualities are used, the lambs if held over, will make profitable wool growers, and when the good shape exists, easily fattening sheep also.

It is very dangerous to the good name of this breed that a keen demand now exists for them. They are a breed easily reared, and easily worked up from half-bred and three-quarter bred ewes so as to appear true to type to the ordinary sheep man, but if all rams in the wool were handled before purchase, and high shouldered and hollow girthed ones rejected, it would do a lot towards keeping the good name now possessed.

The sheep illustrated were imported, per s.s. *Salamis*, by Mr. H. M. Sutherland, of Elcho Estate, Lara, in October last, and arrived in first-class condition. They were bred by Mr. William Cumming, of Allanfearn, Inverness, and purchased by Mr. Sutherland during his recent visit to Scotland. The ram, one year old, was awarded first prize at the Nairn Show, held in August last, whilst the ewes, one year old, secured the first, third and fourth prizes at the Northern Counties Joint Show held this year at Dingwall. The first prize ewe was Champion Leicester at Dingwall and also at Nairn.

THE ELEMENTS OF ANIMAL PHYSIOLOGY.

W. A. *Osborne, M.B., D.Sc., Professor of Physiology and Histology, Dean of the Faculty of Agriculture in the University of Melbourne.*

(*Continued from Page* 693.)

Digestion and Absorption (*continued.*)

DIGESTION IN THE CROP AND STOMACH.—The food, when swallowed, enters the crop or proventriculus, which, as we have seen, is a dilated portion of the œsophagus. In man and the carnivores this organ is wanting, and the food therefore enters directly the fundus of the stomach. In ruminants the crop is represented by the large RUMEN or paunch (first

stomach) with its attendant RETICULUM or honeycomb; in the horse and pig the crop is joined to the fundus without any narrowed portion or neck between. In the crop the food gets warmed up to the temperature of the body, and gets thoroughly macerated with the saliva. Moreover, the diastase of the saliva continues its action on any starch which may be present. *A very important action is the digestion of the food by the*

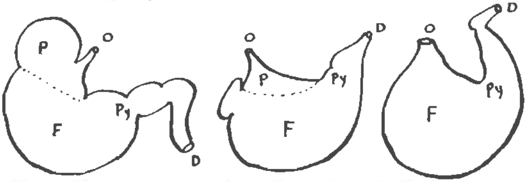


Fig. 47. Diagram of stomach of horse, pig, and dog. O., Œsophagus; P., *proventriculus*: F., *fundus*; Py., *pylorus*; D., *duodenum*.

ferments which it already contains. This autolysis is also aided by harmless bacteria, and in consequence of this combined action, the food mass, which is constantly being rotated and stirred by the movements of the muscular wall, is subjected to a partial digestion which affects most of the food ingredients. Starch is partially transformed into sugar, proteins into proteoses, whilst oils and fats are acted upon only slightly. But the most important action is a semi-digestion of cellulose and woody fibre, by which the vegetable mass is softened, and the contents of the vegetable cells made more accessible. The carbohydrates in the food produce considerable quantities of acids, like lactic acid and butyric acid; and gases,

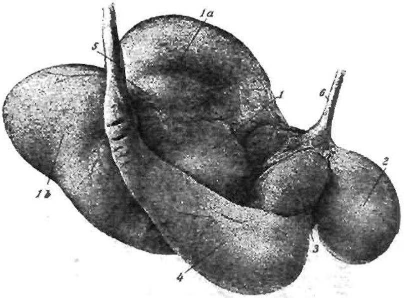


Fig. 48. Proventriculus and Stomach of Sheep. 1, 1a, and 1b, Rumen; 2, Reticulum; 3, Omasum; 4, Abomasum or true stomach consisting of a fundus tapering into a pylorus; 5, Beginning of duodenum. (After Hagémann.)

like hydrogen and carbon dioxide, are also liberated, so that the whole mass in the crop may have a spongy look and feel. Sometimes, as with

young wet clover, the gases produced by fermentation are excessive, and a dangerous distension of the crop (hoven) may be produced.

In the horse and pig, the contents of the crop pass readily into the fundus, the two being practically confluent. But in the ruminants, the passage into the fundus is roundabout, and involves a return to the mouth. In the process of rumination (chewing the cud) the contents of the rumen are forced in small portions at a time into the œsophagus, and by a reverse peristalsis into the mouth. The mass is then subjected to a thorough grinding by the teeth, and is once more swallowed. This time, however, the food mass is not delivered into the rumen by the œsophagus, but by means of a double fold on the roof of the rumen which, closing over, becomes a tube, it passes into the OMASUM or manyplies. The characteristic feature of this organ is the presence of strong muscular leaves lined with coarse stratified epithelium which, by their movements, rasp the food and if they do not actually break up some of the fibres, at least roll the and work them so that the food mass is fit to enter the remaining portions of the canal. The omasum contains a few glands, but they are of little importance. The reticulum or honeycomb acts as a reservoir of fluid, moistening the food mass which is to be ruminated or passed into the omasum. Its exact significance, however, has not been fully worked out. There is no true digestive secretion, nor is there any absorption from the proventriculus.

In the fundus of the true stomach (abomasum of ruminants) we find that the *lining membrane is secretory and capable of pouring out a digestive fluid called gastric juice.* Gastric juice consists chiefly of water, but it has also some very important ingredients, namely, hydrochloric acid, pepsin and traces of other ferments. The amount of hydrochloric acid varies with different animals, and even in the same animal with different diets; generally speaking as much acid is secreted as the protein present can absorb, and frequently a little more, making the free acid present equal to 0.2 to 0.4 per cent. The uses of hydrochloric acid are:—

1. To combine with the proteins and so alter them that they can be attacked by pepsin;
2. To act in the duodenum as an exciter of the pancreas, liver and dueodenal glands;
3. To act as a bacteria-trap killing many, but by no means all, bacteria.

Pepsin is an enzyme which can transform proteins into proteoses (albumoses and peptones) which latter are much simpler bodies and better able to be absorbed. Pepsin however can only act if the protein be altered by treatment with acid and hence the significance of the hydrochloric acid. Traces of lipase or fat-splitting enzyme are also found in the gastric juice but the activity of this ferment is very small. Another enzyme frequently described as occurring in the stomach is rennin which clots milk, changing the caseinogen into casein; but it is very probable that this action is produced by the pepsin, in fact it seems to be a property of every enzyme acting on protein. In herbivores and omnivores one always gets lactic acid in the stomach, but this most probably is derived from the carbohydrate of the food by fermentative change. Salts are also present, the same as are found in the blood, namely chlorides and phosphates of soda, potash, lime and magnesia.

In animals that possess no proventriculus, namely in man and carnivores, the masticated food enters the fundus directly. If the amount of food be great the gastric juice may not penetrate through the mass for some time and so the saliva may continue to act on the starch. When however the food mass is saturated with the acid juice the action of the saliva on the starch is stopped. In such animals autolysis of the food practically does not occur.

Fats in the stomach are acted upon only very feebly; but as the envelopes of the fat-cells are digested, when the fat is of animal origin, a liberation of the fat occurs so that it is prepared for subsequent digestion. Carbohydrates are unchanged in the stomach with the exception of that due to the saliva before it is acidulated. Summarising the digestive processes so far we may state that in mammals food is ground and its surface multiplied by the action of the teeth. In animals with a proventriculus all food constituents are slightly digested by autolysis and bacterial action, but the main action is a loosening and softening of the fibres and cellulose cell-walls. Complex carbohydrates (polysaccharides and notably starch) are partially broken down into sugars by the action of saliva and by autolysis in the crop. In the fundus of the stomach proteins are saturated with acid and subjected to pepsin; by this means all solid protein that is not retained within the woody envelopes is dissolved or pulped, being broken down into the simpler proteoses.

In addition to these functions we may describe some others. The proventriculus or the stomach acts as a reservoir of food so that while the latter may be eaten intermittently (this is especially the case with carnivores) the intestines receive a continuous supply. In most animals the stomach never becomes actually empty and, by this reservoir action, can tide the animal over short periods of starvation. Another important action is the dilution of strong solutions down to a fixed concentration, or conversely, of strengthening weak solutions up to the same standard. Thus a syrup of sugar or a draught of Epsom salts is diluted, but pure water has salts added to it. This is an important action for the delicate lining membrane of the intestine is readily disturbed by concentrations above or below the standard.

It is very doubtful if any absorption occurs before the small intestine is reached except as regards highly diffusible bodies such as alcohol, &c.

The glands of the stomach are stimulated into action by the advent of the food. In man and carnivores gastric juice is poured out in the act of eating or even at the sight or thought of food, just as the human mouth will proverbially water at the bare mention of a lemon. But the food has also a further and direct stimulating influence when it reaches the stomach. In ruminants a response of the stomach before the food has entered it is probably absent.

The pylorus of the stomach is characterised by strong peristaltic waves that drive the stomach contents, when these become sufficiently pulped or digested, through the pyloric sphincter into the duodenum. The glands with which the pylorus is supplied act chiefly by adding some more pepsin to the food; they do not add acids as the proteins have already been saturated with hydrochloric acid in the fundus.

(To be continued.)

DISEASES OF FARM ANIMALS.

S. S. Cameron, M.R.C.V.S., Chief Veterinary Officer.

(*Continued from page* 649.)

DISEASES OF THE URINARY ORGANS.

KIDNEY DISEASES :—Inflammation or Nephritis—Renal abcess—Renal calculus. BLADDER AFFECTIONS :—Inflammation or cystitis—Spasm of neck of bladder—Gravel and bladder calculus—Enlargement of prostate gland. Stone in the sheath (Preputial calculus). Retention of urine—Bloody urine—Thick urine.

Diseases of the kidneys are comparatively rare in the lower animals. They are affected occasionally as a result of some other disease; for instance, their activity may be increased beyond normal limits in affections of the liver when they take on the function of excreting from the blood various matters that are usually excreted in the bile; but, excepting nephritis and renal abscess and calculi, the kidneys are not prone to disease, and even those mentioned are rare.

KIDNEY DISEASES.

Inflammation of the Kidneys (Nephritis).

Although inflammation of the kidneys is a common diagnosis for obscure lameness, and also in cases of colic and of partial loss of power in the hind extremities, in point of fact it seldom occurs except as the result of the administration of excessive dose of diuretic or staling medicine given ignorantly with the object of "clearing the water." Odd cases have been recorded as following on the blistering of a large skin surface, through the irritation produced by the absorption of *cantharidine*, the active principle of a fly blister.

SYMPTOMS.—The active symptoms simulate those of colic, with total suppression or diminution in amount of urine; but, contrary to his action in colic, the horse stands continuously, arches his back a great deal and straddles stiffly on being moved. Later on there may be unconsciousness, convulsions, and other signs of ureamic poisoning.

TREATMENT.—The liver, bowels and skin should be got to act fully by the giving of purgatives and diaphoretics. Hot fomentations to the loins and warm clothing of the body and limbs will be beneficial in distributing the circulation. Ten-drop doses of tincture of aconite may be given as a febrifuge. To relieve the pain, which is at times intense, hypodermic injections of morphia may be given.

Renal Abscess.

Abscesses may occur in the kidney from pyæmia. They are occasionally seen in sheep affected with multiple abscesses, but they appear to occasion few ill effects and no marked symptoms are shown.

Renal Calculus.

Stone in the kidney is occasionally found in horses and cattle, but dogs and sheep appear to be most prone to it. The calculus usually forms in the pelvis of the kidney, gradually increasing in size through the accretion of salts deposited from the urine. As it grows it assumes the shape of the cavity in which it lies, having projections on the surface corresponding to

the openings of the uriniferous ducts. It distends the pelvis and by pressure may cause absorption of the kidney tissue to an extent to interfere with the function of the organ. In such cases the animal becomes debilitated, but as a rule there are no noticeable symptoms during life. It is conceivable that renal calculi might be removed by surgical operation, but no cases of such have been recorded. The fact that the diagnosis can be little more than suspicion would scarcely warrant operative interference.

The ureters or tubes leading from the kidneys to the bladder are little subject to abnormalities. Occasionally a renal calculus, or fragment of such, may pass from the kidney into the ureter and become blocked in it. This may be a rare cause of apparent colic.

BLADDER AFFECTIONS.

Inflammation of Bladder (Cystitis).

This also is a rare affection and seldom occurs in animals, if ever, except from overdoses of irritant drugs.

The SYMPTOMS are those of distress from pain and fever; there is frequent straining to pass a small quantity of thick blood-tinged slimy urine. In females, excitement of the external genitals is obvious.

Figs. 115 and 116. Male and female catheters for farm animals.

TREATMENT.—In addition to sedatives internally and the giving of as much water as the patient will drink, the local treatment should include the injection into the bladder by means of a catheter of soothing fluids. Infusion of poppies or opium, warm solution of bicarbonate of soda or boracic acid (half an ounce to the pint), clear linseed mucilage or jelly and solutions of gum or starch are suitable agents to inject.

Spasm of the Neck of the Bladder.

This sometimes occurs in association with spasm of the bowels during an attack of colic. It will usually pass away without treatment on the subsidence of the colicky pains. If the spasm persists however it may be counteracted by applying a stimulating liniment to the skin immediately below the anus in males or by injecting warm water into the vagina in females.

Gravel and Bladder Calculus.

This occurs rather frequently in sheep and also in horses. It may take the form of a collection of sand-like calcareous matter (sabulous matter), lying in the cavity of the bladder, or the lime salts may concrete into a calculus or stone. In the former case the urine will be frequently thick from the suspension in it of a quantity of the sabulous matter. When a calculus is present it may wound the lining membrane of the bladder at times and cause the passage of blood-tinged urine.

TREATMENT.—Removal by operation is the only effective treatment. This is comparatively easy to accomplish in the mare, as with the aid of cocaine and atropine the mouth of the bladder (urethra) may be easily dilated to allow of the passage of the operator's hand. In the horse the operation (lithotomy) is more difficult and dangerous and should not be

resorted to except by an expert. A catheter is passed into the bladder through the urethra. The canal of the urethra is then opened by cutting down on to the catheter just below the anus and in front of where it winds forward from the ischial arch. The opening is made sufficiently large to admit of the exit of the calculus, which should be manipulated with the hand in the rectum. Special lithotomy forceps may be required to grasp and remove a calculus but the sandy deposit may be removed with a specially shaped spoon. The risk of the operation lies in the difficulty of getting the wound to heal, and a fistulous opening through which the urine passes will often remain.

Enlargement of the Prostate Gland.

The prostate is a small gland encircling the urethra at the neck of the bladder, and in very fat dogs—pet dogs principally—it frequently becomes enlarged and the subject of fatty degeneration. In these cases there is painful and frequent urination, or there may be complete retention of urine.

Stone in the Sheath (Preputial Calculus).

Bulls and rams are sometimes seen with the long hairs surrounding the point of the sheath encrusted with a whitish calcareous deposit. This is due to an excess of saline matter, generally lime phosphates, being deposited from the urine as it trickles slowly from the sheath. Although the deposits cause little inconvenience in bulls it is advisable that the pasture should be changed or the diet modified as their presence is an indication of the liability to the formation of calculi internally.

Wether sheep are frequently affected with the same condition, and in them it is a much more serious affair.

Retention of Urine.

By retention of urine is meant the non-expulsion of urine already formed and contained in the bladder, not the scantiness of urine on account of its non-secretion. It may be due to various causes, the principal of which are:—

(1) Loss of power of the bladder to contract and expel the urine. This may occur from over-distension as when a horse has been driven all day and has not staled. The wall of the bladder may become stretched to such an extent as to lose its power of contraction.

(2) Nervous atony, as seen in the paralysis of the bladder in milk fever in cattle.

(3) Spasm of the neck of the bladder as in cases of colic in horses.

(4) Constriction of the urethral passage by enlargement of the prostate gland as seen in pet dogs.

(5) Stricture of the urethra, occurring as the result of an inflammation or pseudo-gonorrhœa.

(6) Blocking of the urethra by a calculus (this is a fairly common occurrence in sheep) or by pellets of wax at the outer opening.

(7) Various surgical conditions such as phymosis and paraphymosis.

SYMPTOMS.—The chief indications of retention of urine are:—Uneasiness, lashing of the tail, shifting and paddling of the hind limbs and feet, frequent posing as if to urinate, and perhaps colicky symptoms. Exploration with the hand through the rectum in males and through the vagina in females manifests the distended state of the bladder. In dogs the distension may be felt on manipulating the abdomen just in front of

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the pelvis. The distension is a fluctuating or resilient one. The longer the condition is left unrelieved the more urgent will be the symptoms on account of the continuance of the secretion of urine, and, if left unrelieved ureamic poisoning may result as previously described.

Treatment.—Sometimes pressure with the hand through the rectum or vagina will cause expulsion of the bladder contents. If this fails the catheter should be passed without delay and about half the urine removed. If the distended bladder be wholly emptied at one time serious results may follow. The blood vessels in the lining being suddenly deprived of the support caused by the pressure of the contained urine, to which they have become accustomed, will become dilated and many actually rupture, causing immediate discharge of bloody urine and ultimately, perhaps, a serious inflammation (cystitis).

Bloody Urine.

The presence of actual blood in the urine must be carefully distinguished from the presence only of the colouring matter of the blood such as occurs in so-called red water. In the former case the red blood corpuscles should be easily distinguishable on microscopic examination.

Bloody urine may be due to any of the causes previously mentioned or to a rupture of the lining of some part of the urinary passage caused by overstrain during exertion.

Treatment.—Tincture of iron (perchloride) in one or two dram doses may be given in a pint of starch or linseed mucilage, along with three or four drams of dissolved aloes. The iron to lessen the hæmorrhage, the mucilage as a soothing agent, and the aloes as a laxative to mitigate the tendency to inflammation. The iron and mucilage may be repeated twice a day until the condition is overcome. In obstinate cases a sedative and styptic fluid may be injected into the bladder by means of a catheter, *e.g.*, Tincture of iron half an ounce, decoction of poppies one ounce, warm water, in which is dissolved half an ounce of gum arabic, one pint.

Thick Urine.

This term is applied to the urine when it contains (*a*) excess of urea and other urine salts causing a powdery sediment to deposit on standing, (*b*) excess of albumen or mucus causing it to be slimy and to deposit a mucoid sediment.

Excess of Urea, &c., results from unusual exercise imposed suddenly, and is merely a sign of considerable tissue-change in the body, the kidneys being called upon to quickly remove the large amount of waste products resulting therefrom and circulating in the blood. It need not be interfered with except it persists over a few days when a tablespoonful of saltpetre mixed with a mash will usually set things right.

Albumen is also found in the urine after hard work and except it is present in excessive quantity, which is a rare thing, no alarm need be occasioned. An occasional dose of sweet spirit of nitre diluted with water used to damp the feed will be beneficial in such cases.

(The remaining urinary organs are common to the generative organs, and their diseases will be dealt with under that head.)

The Index of Vol. v. will be supplied with the first number of Vol. vi., viz., 8th January, 1908.